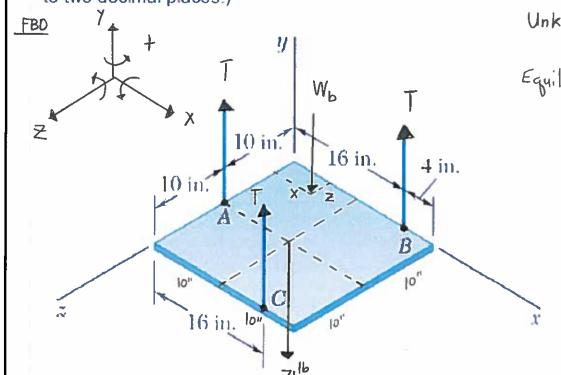
**Engineering Mechanics: Statics** 

Page

A (20 ×20)-in, square plate, as shown in the figure, weighs 71 lb and is supported by three vertical wires. Determine the weight and the location of the lightest block that should be placed on the plate if the tensions in the three wires are to be equal. (Round the final answer to two decimal places.)



Unknowns: Wh, T, x, Z

Equilibrium: 
$$\xi_{M_z}^+ = 2T(16'') - 71''(10'') - W_b(x) = 0$$
  
 $32T - 710 - W_b x = 0$ 

$$\xi_{1}^{\prime}M_{X} = -7(20'') - 7(10'') + 71''b(10'') + W_{b}(z) = 0$$

$$= -30T + 710 + W_{b}z = 0$$

$$\xi_{y}^{\dagger} = 3T - W_{b} - 71^{1b} = 0$$

The weight of the lightest block is lb, at x =in and z = **CVEN 221-502** 

Topic \_\_\_\_\_

Date 10-3-17

**Engineering Mechanics: Statics** 

Equations:

(1) 
$$32T - 710 - W_b x = 0$$

$$(2) - 30T + 710 + W_b 2 = 0$$

(3) 
$$3T - W_b - 71 = 0$$

We have 4 unknowns, but only 3 independent equations. Therefore, we need an equation of condition to solve this.

The equation of condition comes from symmetry.

Determine Z: By symmetry Z must be 10" -or-

$$-30(71 + W_b)\frac{1}{3} + 710 + W_b Z = 0$$

<b>CVFN</b>	221-502
CALIA	441-JU2

Topic \_\_\_\_\_

Date  $\frac{|0-3-17|}{|0-3-17|}$ 

Engineering Mechanics: Statics

Determine X to minimize Wb:

$$32(71 + W_b)\frac{1}{3} + 710 - W_b X = 0$$

$$757.33 + 10.67 W_b - 710 - W_b x = 0$$

$$\Rightarrow W_b = \frac{-47.33}{(10.67-x)}$$

\* We know Wb must be positive to satisfy equilibrium, therefore X > 10.67"
and to minimize Wb we need to maximize the denominator.

All original material presented was created by Michael S. Brackin, Ph.D., P.E. and is copyrighted 2017. No Part or portion of this material may be copied, transmitted or otherwise used without the express written consent of Michael S. Brackin, Ph.D., P.E.