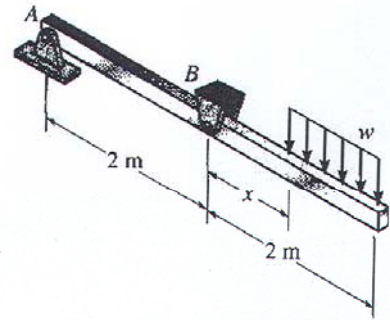


MAK 205  
QUIZ 1 TELAFİ

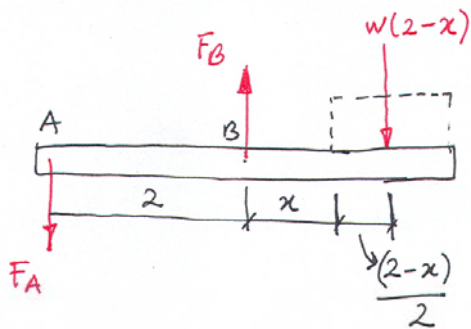
Adı ve Soyadı:

Numarası:

1-106. The bar is held in equilibrium by the pin supports at A and B. Note that the support at A has a single leaf and therefore it involves single shear in the pin, and the support at B has a double leaf and therefore it involves double shear. The allowable shear stress for both pins is  $\tau_{\text{allow}} = 150 \text{ MPa}$ . If a uniform distributed load of  $w = 8 \text{ kN/m}$  is placed on the bar, determine its minimum allowable position  $x$  from B. Pins A and B each have a diameter of 8 mm. Neglect any axial force in the bar.



Probs. 1-106/107/108



$w = 8 \text{ kN/m}$

$$\left( \sum M_A = 0 \right) \quad F_B \cdot 2 - w(2-x) \left[ 2 + x + \frac{(2-x)}{2} \right] = 0$$

$$2F_B - 8(2-x) \left( 3 + \frac{x}{2} \right) = 0$$

$$\boxed{2F_B - 48 + 16x + 4x^2 = 0} \quad \underline{\text{2 points}} \quad (1)$$

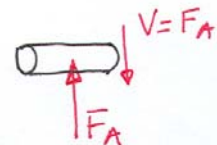
$$\left( \sum M_B = 0 \right) \quad F_A \cdot 2 - w(2-x) \left( \frac{x}{2} + 1 \right) = 0$$

$$2F_A - 8(2-x) \left( \frac{x}{2} + 1 \right) = 0$$

$$\boxed{2F_A - 16 + 4x^2 = 0} \quad \underline{\text{2 points}} \quad (2)$$

Pin A nin kırıldığını varsayalım

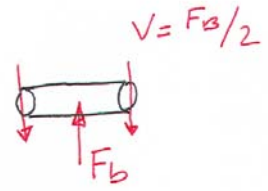
$$\tau_{\text{allow}} = \frac{F_A}{A_A} \Rightarrow 150(10^6) = \frac{F_A}{\frac{\pi}{4}(0.008)^2}$$



$$\boxed{F_A = 7539.8 \text{ N} = 7.5398 \text{ kN}} \quad \underline{\text{2 points}}$$

Pin B nin kırıldığını varsayalım

$$\tau_{\text{allow}} = \frac{F_B}{2} \Rightarrow 150(10^6) = \frac{F_B}{2 \cdot \frac{\pi}{4} (0.008)^2}$$



$$F_B = 15079.6 \text{ N} = 15.0796 \text{ kN}$$

2 point

\*  $F_A = 7.5398 \text{ kN}$  (2) denkleminde yerine koyarsak

$$4x^2 - 16 + 2F_A = 0$$

$$4x^2 - 16 + 2(7.5398) = 0$$

$$4x^2 - 16 + 15.0796 = 0$$

$$4x^2 - 0.9204 = 0$$

$\Rightarrow$

$$x = 0.4797$$

1 point

\*  $F_B = 15.0796 \text{ kN}$  (1) denkleminde yerine koyarsak

$$2F_B - 48 + 16x + 4x^2 = 0$$

$$4x^2 + 16x - 48 + 2(15.0796) = 0$$

$$4x^2 + 16x - 17.8408 = 0$$

$$ax^2 + bx + c = 0$$

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 4$$

$$b = 16$$

$$c = -17.8408$$

$$x_1 = \frac{-16 + 23.27}{8} \Rightarrow$$

$$x_1 = 0.9086$$

$$x_2 = \frac{-16 - 23.27}{8} \Rightarrow$$

$$x_2 = -4.90875$$

Minimum allowable position of x

$$x = 0.9086 \text{ m}$$

1 point.