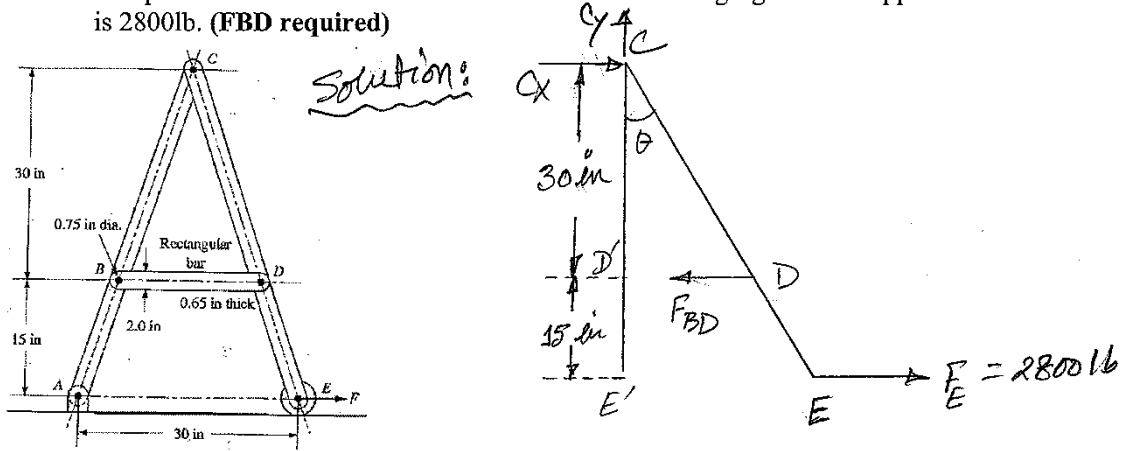


MAE 2312 - 001
Solution of Homework 2
Assigned: 1/29/09

HW2-1: Compute the stress in member BD shown in the following figure if the applied force F is 2800lb. (FBD required)



Solution:

$$A = 2.0 \times 0.65 \text{ in}^2 = 1.3 \text{ in}^2$$

$$L_{CD} = 30 \text{ inch}, L_{CE} = 45 \text{ inch}$$

$$\sum M_C = 0 \Rightarrow F_E \cdot L_{CE} - F_{BD} \cdot L_{CD} = 0$$

$$\Rightarrow 2800 \times 45 - F_{BD} \times 30 = 0$$

$$\Rightarrow F_{BD} = \frac{2800 \times 45}{30}$$

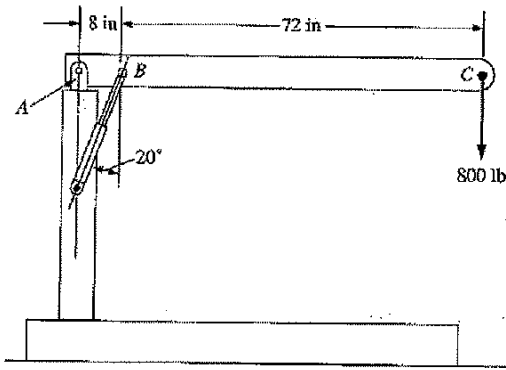
$$\therefore F_{BD} = 4200 \text{ lb}$$



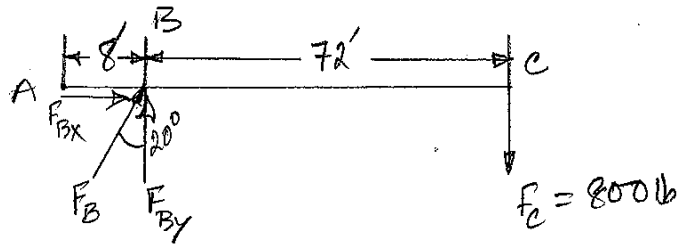
$$\sigma_{BD} = \frac{F_{BD}}{A} = \frac{4200 \text{ lb}}{1.3 \text{ in}^2}$$

$$\therefore \sigma_{BD} = 3230.77 \text{ PSI}$$

HW2-2: A small hydraulic crane, like that shown in the figure below, carries an 800-lb load. Determine the shear stress that occurs in the pin at B which is in double shear. The pin diameter is 3/8 in. (FBD required)



Solution:



$$L_{AC} = 80 \text{ inch}$$

$$L_{AB} = 8 \text{ inch}, d = \frac{3}{8} \text{ inch}$$

$$\sum M_A = 0 \Rightarrow -F_c \cdot L_{AC} + F_{By} \cdot L_{AB} = 0$$

$$\Rightarrow -800 \times 80 + F_B \cos 20^\circ \times 8 = 0$$

$$\Rightarrow F_B = \frac{800 \times 80}{8 \cos 20^\circ} = 8513.42 \text{ lb}$$

shear area of

the pin, $A_s = 2 \left(\frac{\pi}{4} d^2 \right) = 2 \left(\frac{\pi}{4} \left(\frac{3}{8} \right)^2 \right) = 0.221 \text{ in}^2$

Double shear $\therefore \tau = \frac{F_B}{A_s} = \frac{8513.42 \text{ lb}}{0.221 \text{ in}^2}$

$$\therefore \tau = 38522.26 \text{ Psi}$$