

ES226
Engineering Mechanics: Statics
Lafayette College
Engineering Division
May 13, 2005

Final Exam
Time Limit: 2 hours

Closed Book. Closed Notes. Each student is allowed a single page of handwritten notes (no photocopied notes of other students allowed), pencils, erasers, and calculator, only.

Name:

Answer each question on the same page or on attached engineering paper. When applicable, write the final answers in the box in the bottom right-hand corner of the page. (Continue on the back of the question sheet if needed).
Show all work **Clearly and Neatly**

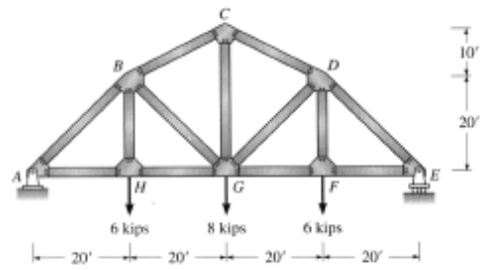
HINT: REMEMBER TO USE "STATIC EQUILIBRIUM" ON EACH PROBLEM

Score (Max Points 100)

Note that there are about 6 Problems Total on the Final in Fall 2010

There are more than 6 practice problems given below in the sample exam

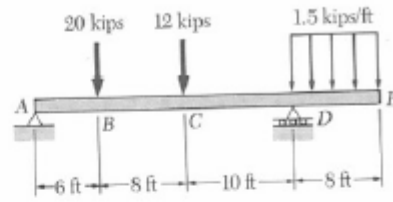
Determine the force in member CG and indicate whether in tension or compression.



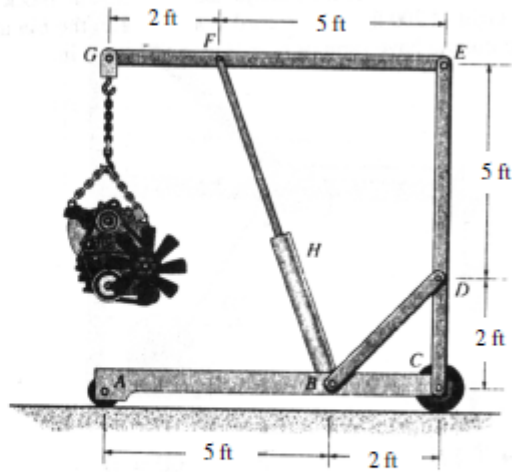
Final Answer:

$F_{CG} = \underline{\hspace{2cm}}$ kips

Draw the shear and bending moment diagrams for the beam and loading shown



Given: the hoist supports the 750 lb engine. Determine the force in member BD and in member BF, which contains the hydraulic cylinder H.

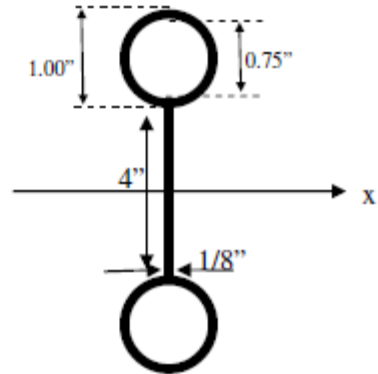


Final Answers:

Force $BD =$ _____

Force $BF =$ _____

Determine the moment of inertia I_x of the beam section shown for bending about the x-axis, taken about the section's centroid. The section is composed of hollow tubes (outside diameter 1.00", inside diameter 0.75"), welded to a $1/8"$ x $4"$ solid plate.



Final Answer:

$$I_x = \text{_____} \text{ in}^4$$

A packing crate of mass 40 kg must be moved to the left along the floor without tipping. Knowing that the coefficient of static friction between the crate and the floor is 0.35, determine (a) the largest allowable value of the angle, (b) the corresponding magnitude of the force P .

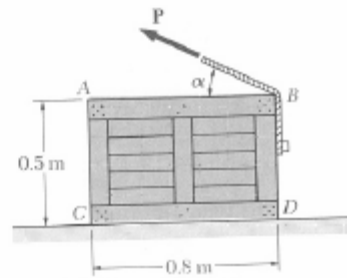
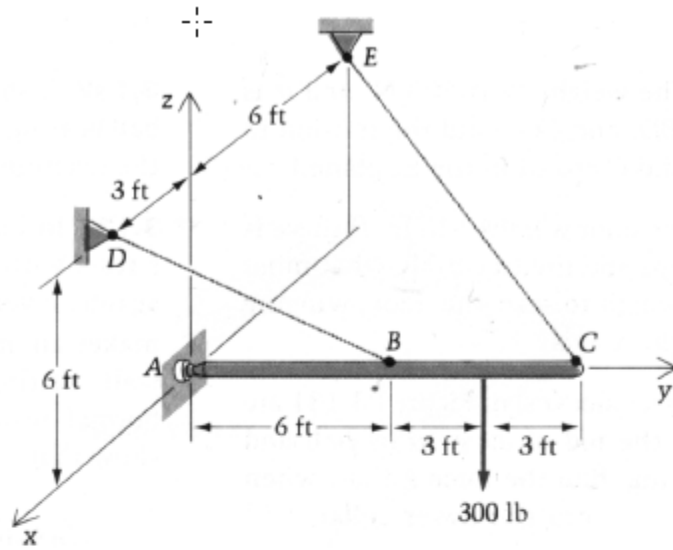


Fig. P8.21 and P8.22

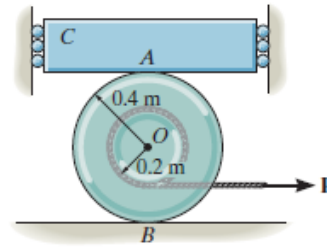
Bar ABC is supported by a ball-and-socket at A and cables BD and CE. Find the tension in each cable and determine the x,y,z components of the support reaction at A (and clearly indicate on your FBD the positive directions of force components).



Final Answers:

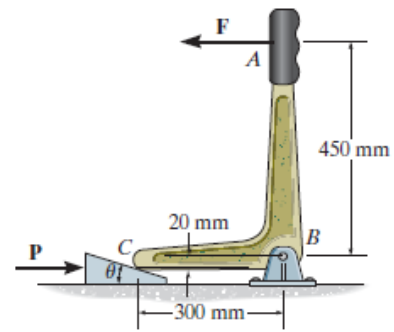
NEW MATERIAL

Block C has a mass of 50 kg and is confined between two walls by smooth rollers. If the block rests on top of the 40-kg spool, determine the minimum cable force P needed to move the spool. The cable is wrapped around the spool's inner core. The coefficients of static friction at A and B are $\mu_A = 0.3$ and $\mu_B = 0.6$.



NEW MATERIAL

If the horizontal force \mathbf{P} is removed, determine the largest angle θ that will cause the wedge to be self-locking regardless of the magnitude of force \mathbf{F} applied to the handle. The coefficient of static friction at all contacting surfaces is $\mu_s = 0.3$.



NEW MATERIAL

Determine the moment of inertia of the beam's cross-sectional area about the x axis.

