ES226
Engineering Mechanics: Statics
Lafayette College
Engineering Division

Exam 2
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.

As part of your answer for each problem, draw FBDs that clearly indicate the forces acting on them where appropriate. Also, show all calculations.

Name:

Answer each question on the same page, with 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**

Score (Max Points 100)

Problem #1. (Max Points 15):

Problem #2. (Max Points 20):

Problem #3. (Max Points 25):

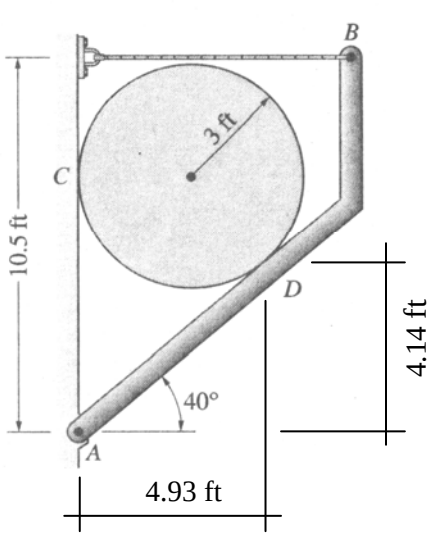
Problem #4. (Max Points 20):

Problem #5. (Max Points 20):

Problem 1:

Determine the tension in the cable at B, given that the uniform cylinder weighs **350 lbs**, with the weight acting through the center of the cylinder. Neglect friction and the weight of the bar AB. There is a pinned support at A.

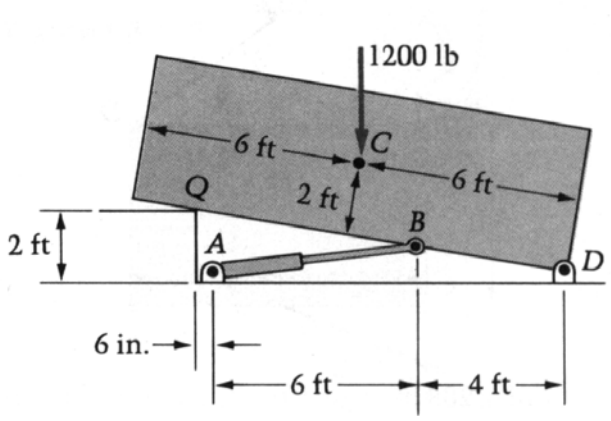
As part of your answer, draw FBDs that clearly indicate the forces acting on them. Also, show your calculations.



Final Answers:

Problem 2:

For the dump-truck bed shown, determine the force in the hydraulic cylinder that is needed to just lift it off of the support at Q. The weight of the bed is 1200 lbs, centered at point C. A, B, and D are all pin connections (assume that the pins have negligible height).

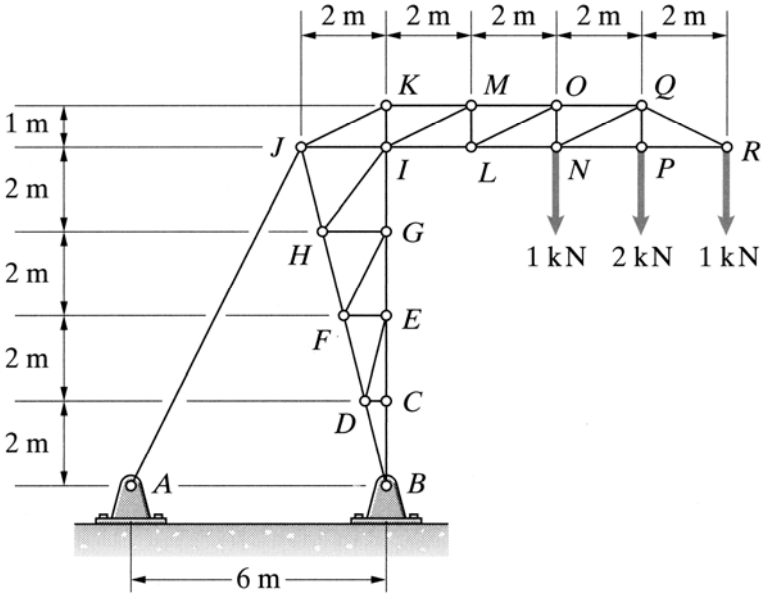


Final Answers:

Problem 3: Part A

The truss supports loads at N, P, and R.

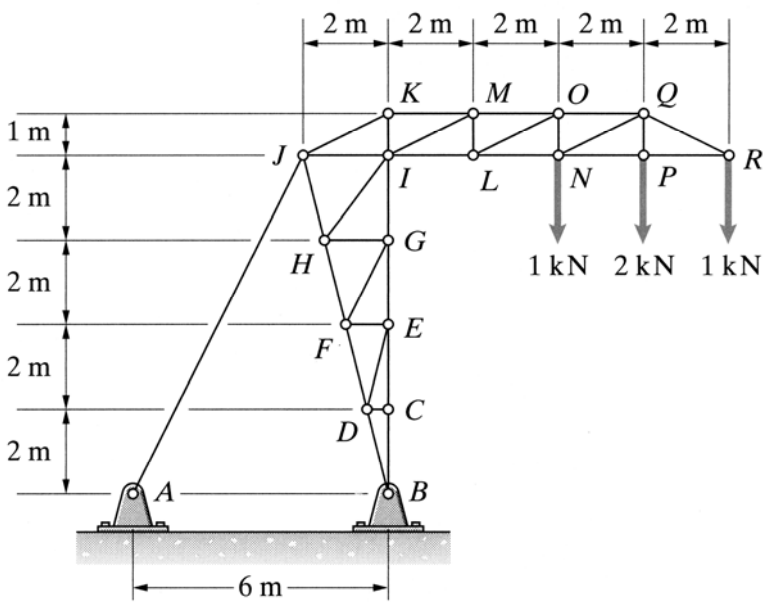
Use METHOD OF SECTIONS to <u>determine the force in member ***IL, KM,*** and ***IM***</u> and indicate whether the member is in tension (T) or (C).



Final Answers:

Problem 3: Part B

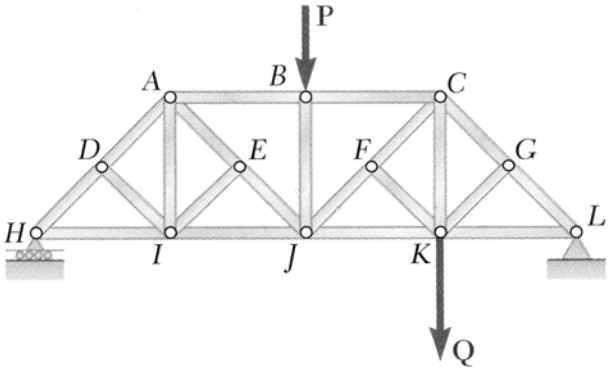
If the force in member ***LN*** of the truss is 8 kN (C) and the force in member ***ON*** is 4 kN (T), use METHOD OF JOINTS to determine the force in members ***NP*** and ***NQ*** of the truss.

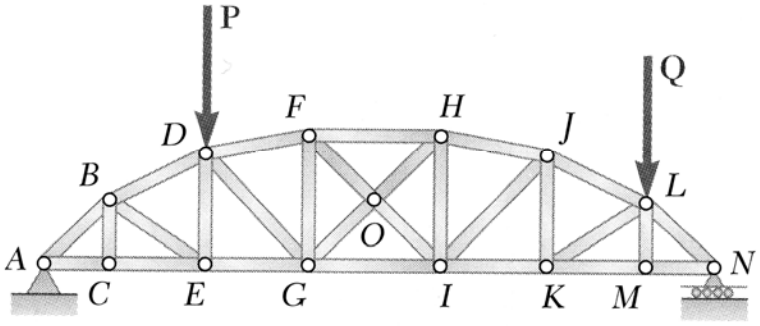


Final Answers:

Problem 3: Part C

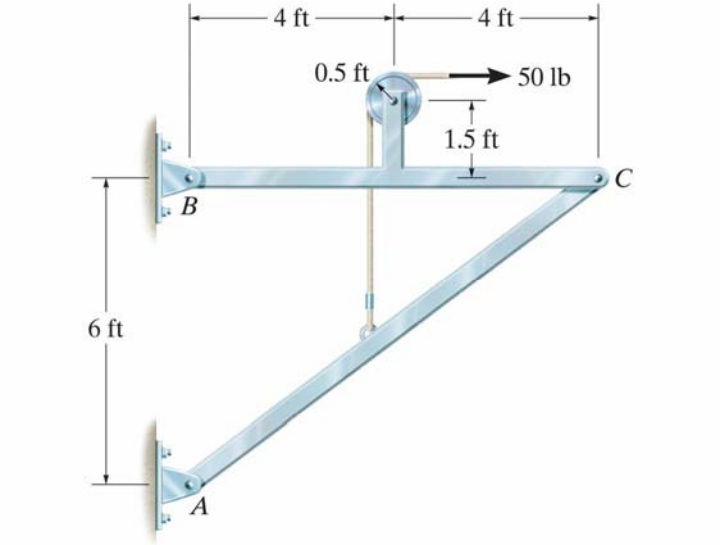
Identify and name all of the zero-force members for each truss below.





Problem 4:

Determine the horizontal and vertical components of the force at pins B and C for the frame shown.



Find the internal shear force, normal force, and moment on bar BC at a location 2 feet from the pin connection at C

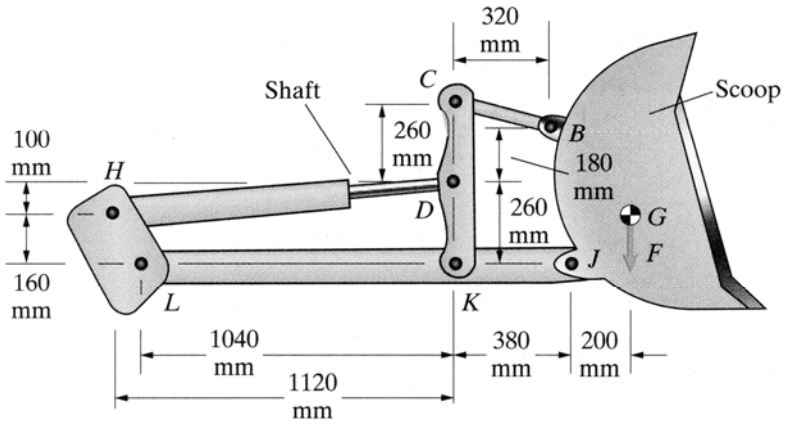
Problem 5:

The structure shown in the diagram supports a downward force ***F* = 1800 *N*** at G.

Determine forces at pin ***K*** and the forces in members ***BC*** and ***DH***.

Hint: Break the structure up into pieces and start drawing FBDs.

The piece HL is connected to the rest of the machine, so don't use this piece for a FBD.



Final Answers: