Name _____ SID _____

Introduction to Solid Mechanics
ME C85/CE C30

Midterm Exam 1

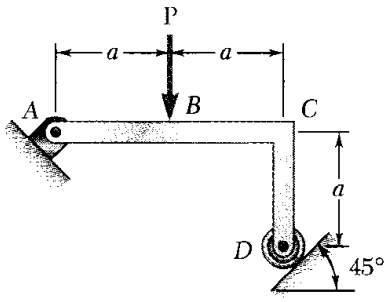
Fall, 2012

Problem	Possible	Score
1	20	
2	30	
3	25	
4	25	
Total	100	

1. Do not open this exam until you are told to begin.
2. Put your name and SID on **every** page.
3. You may not use a calculator, but you may use a straightedge to help you draw figures.
4. You may use one 8-1/2 x 11 sheet of notes, but not your book or any other notes.
5. Store everything else out of sight.
6. Turn off cell phones.
7. There will be no questions during the exam. Write your concerns or alternative interpretations in exam margins.
8. Write all answers in the space provided in this exam.
9. Be concise and write clearly. Identify your answer to a question by putting a box around it.
10. Use only the front sides of the answer sheets for your answers. You may use the backs of pages for "scratch" paper, but if there is work that we should see, be sure to point that out in the main body of the exam.
11. Time will be strictly enforced. At 9:00, you must put down your pencil or pen and immediately turn in your exam. Failure to do so may result in loss of points.

Name _____ SID _____

1. (20 points) The massless, rigid structure ABCD is loaded at point B by a vertical force of magnitude P. Determine the reaction forces at pin A and roller D.



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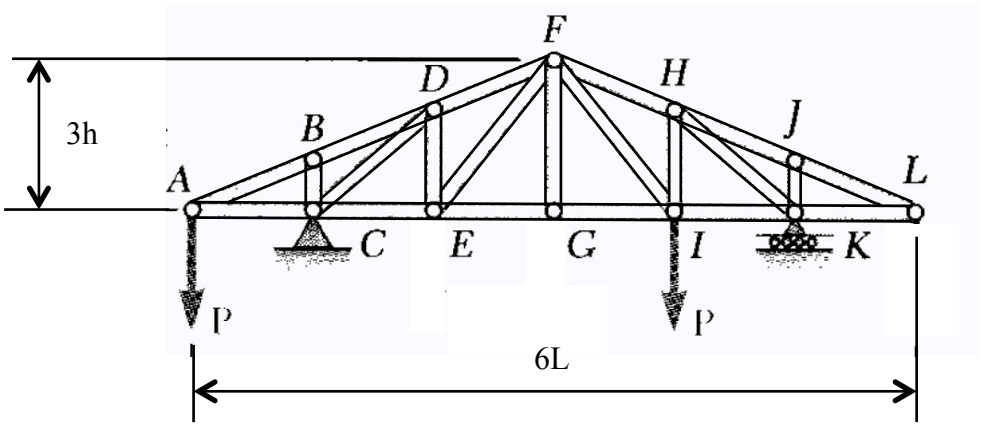
2. (30 points total) The truss shown below is loaded by vertical forces of magnitude P at joints A and I. It is supported by a pin at joint C and a roller at joint K. All of the horizontal members of the truss are of length *L*, and the vertical member BC has length *h*. For purposes of this analysis, all members may be treated as massless.

(a) (5 points) Identify any zero-force members that exist for this loading.

(b) (10 points) Determine the reaction forces at C and K.

(c) (15 points) Determine the forces in members CE and DE. Be sure to indicate clearly whether each member is in tension or compression.



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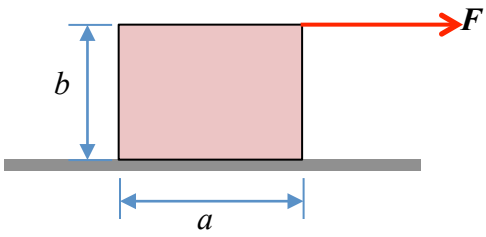
3. (25 points) Consider a block of mass m resting on a rough horizontal surface, with coefficient of static friction μ_s between the block and the surface. A horizontal force $\boldsymbol{F}$ is applied at the upper right-hand corner of the block. The magnitude of this force is slowly increased until the block begins to move.

Determine the force $\boldsymbol{F}$ and coefficient of static friction μ_s that will cause in the block to begin to slip and tip at the same time. That is, the impending motion is simultaneous slipping and tipping.



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4. (25 points) The massless frame shown consists of two rigid members, ABC and BD, and is loaded at point A by a vertical force **P**.

Determine the reaction force at point C, written in terms of its horizontal and vertical components. Be sure to clearly identify the direction (right/left, up/down) that component acts.