Your TA, Section # and Section time:

Your name:

Cornell TAM 2020

No calculators, books or notes allowed.

Catch-all makeup prelim

Dec 4, 2010

3 Problems, 90 minutes (+ up to 90 minutes overtime)

Directions.

To ease your TA's grading and to maximize your score, please:

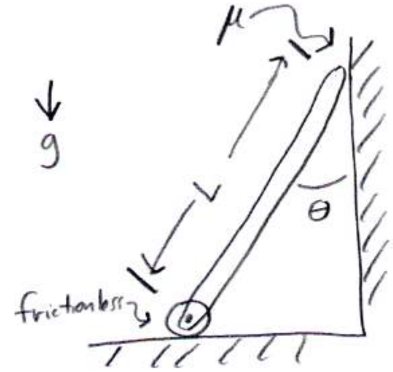
- Draw **Free body diagrams** whenever force, moment, linear momentum, or angular momentum balance are used.
- Use correct **vector notation**.
- A+ Be (I) neat, (II) clear and (III) well organized.
- TIDILY REDUCE and $\boxed{\text{box in}}$ your answers (Don't leave simplifiable algebraic expressions).
- >> Make appropriate `Matlab code` clear and correct.
  You can use shortcut notation like "$T_7 = 18$" instead of, say, "`T(7) = 18`".
  Small syntax errors will have small penalties.
- Clearly **define** any needed dimensions ($\ell, h, d, \ldots$), coordinates ($x, y, r, \theta \ldots$), variables ($v, m, t, \ldots$), base vectors ($\hat{\imath}, \hat{\jmath}, \hat{e}_r, \hat{e}_\theta, \hat{\boldsymbol{\lambda}}, \hat{\boldsymbol{n}} \ldots$) and signs ($\pm$) with sketches, equations or words.
- **Justify** your results so a grader can distinguish an informed answer from a guess.
- If a problem seems *poorly defined*, clearly state any reasonable assumptions (that do not oversimplify the problem).
- ≈ Work for **partial credit** (from 60 –100%, depending on the problem)
  - Put your answer is in terms of well defined variables even if you have not substituted in the numerical values.
  - Reduce the problem to a clearly defined set of equations to solve.
  - Provide Matlab code which would generate the desired answer (and explain the nature of the output).
- **Extra sheets.** Put your name on each extra sheet, fold it in, and refer to it at the relevant problem.
  Note the last page is **blank** for your use. Ask for more extra paper if you need it.

Problem 7: ____ /25

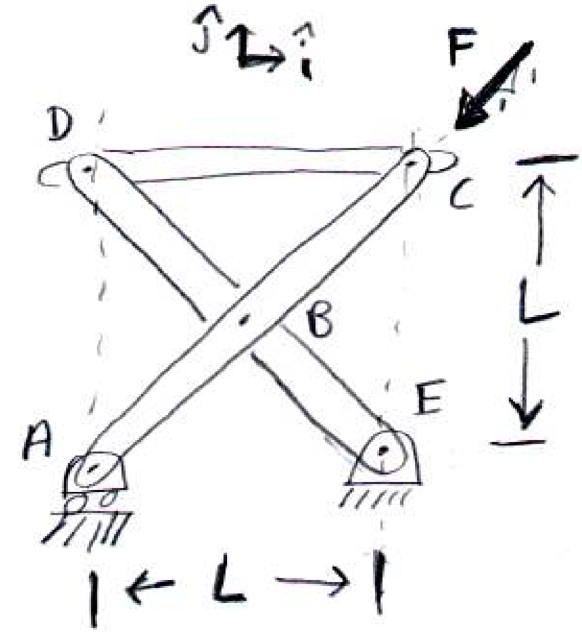
Problem 8: ____ /25

Problem 9: ____ /25

7) A uniform ladder with mass m and length L leans against a wall. There is friction μ against the wall and a frictionless roller on the floor. Depending on the values of m, L, g, μ, and θ static equilibrium might not even be possible. If $m > 0$, $L > 0$, $g > 0$ and $\pi/2 > \theta > 0$ either find the minimum value of μ for equilibrium or prove that equilibrium is not possible.



8) Given F and L find the reactions at A and E and any other force of interaction in the structure (you choose).



9) The beam shown has given M, L, b, h, E, G, and ν. Find the maximum values of tension and shear stress in the beam and clearly describe the location(s) where they occur (where along the length and where in the cross section)?