TAM 202 final exam comments on problem 1 by Vijay:

1. Free body diagram: 10 points
2. Force balance equations: 5 points
3. Numerical simplification and answer: 5 points
4. No mention about inequality in answer: 1 point deducted

I have been very severe if the free body diagram is incorrect and the reactions are marked incorrectly.

Engrd 202
Fall '02
Final . Prob 2

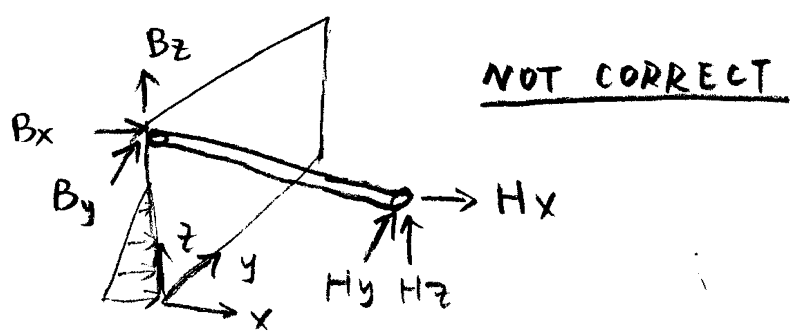
2. this is a 3D statics problem.

ⓐ FBD 5/20 pts

some students only had reactions at pt. A. But in the problem, it says " The door is hinged along its bottom." Thus we actually have distributed reactions along bottom AD. If you specify the reactions only at A and at D, we still give full marks. But reactions should have x, y, z components.

Very few made mistake in drawing the hydrostatic forces.

FBD of the **DOOR** so we should not do like this



ⓑ To figure out the axial force in rod BH, we could do moment balance about axis AD. In this way, reactions from the hinge do not come into the picture. Compared w/ our hw, this is pretty straight forward. we give 3/20 to correctly pointing out hydrostatic forces. Another 2/20 to correct expression of $\overrightarrow{HB}$. The rest 7/20 is for solving the problem for $\vec{T}_{HD}$. Unfortunately, there were quite a few exam books which did not know how to do 3D moment balance eqns. Some still prefered the high school way (finding a lot unnecessary angles w/ a lot of triangles). It may be helpful in the future if we make sure we are comfortable w/ $\vec{r} \times \vec{F}$ in 3D.

We also give 3/20 to correct algebra.

(c) $\delta = \frac{PL}{AE}$ is given in the formula sheet. 2/20

And just a few forgot to mention it is shortened or lengthened. 1/20

Comments for problem number 3 on the final exam, Engrd 202, fall 2002.
Graded by Peeyush Bhargava

Part 3 a). Almost all the students got this right.

Part 3 b). Minus 1 for using the wrong formula for polar moment of inertia. Minus 1 if the student does not mention where the maximum shear stresses occur.Most of the people got this right.

Part 3.c) The important thing to realize is that the element shown is in a state of pure shear and that there are no stresses on the outside surface. Full points only if completely right. Points taken off if axial stresses are shown on the element or if stresses are shown on the outside surface.

Part 3d) If you realize or know that the element is in pure shear, then getting this correct us easy. Many students used the stress transformation formula to get the wrong answer. Full points only if completely correct.

Part 3e) Full points only if free body diagram is drawn correctly and the calculation is also correct. If you say $T_{w'} = T_L$, then points are taken off.

TAM 202 Final Exam | Problem 4

1. Grading Policy

① There are totally 20 pts for this problem: 6 pts for part (a), 8 pts for part (b), and 6 pts for part (c).

② For part (a), in order to get full credit, you should have correct FBD, equilibrium equations and the results. Without a FBD, I don't know what the forces in the equilibrium equations mean, and 1 ~ 2 pts are taken off for no FBD or incorrect FBD.

③ For part (b), in order to get full credit, you must get correct shapes of the curves (e.g. straight lines are wrong), and correct values of shear and moment at A and at the midpoint. According to the question, those values should be marked on the curve, but if you write them down clearly, no points are taken off.

④ For part (c), in order to get full credit, you should have calculated the position of the neutral axis, the value of moment of inertia and the correct diagram of stress distribution (linear distribution; tension on the top; compression on the bottom; $\sigma = 0$ at neutral axis; values of σ on the top and bottom).

⑤ Some students did part (a) & (b) together, i.e. they found V & M distribution, and then substituted $x = 1\,m$ for A. This is acceptable

Prob 4 cont'd

⑥ If your mistakes are purely calculation mistakes, only 1 or 2 points are taken off, depending on how bad the mistakes are. But mistakes due to not understanding the materials (e.g. if you didn't get the shapes of the curves correctly; if you didn't draw linear distribution for σ) are serious.

⑦ Some students reversed the sign in V & M diagram (they should both be negative). But if your signs are consistent with you FBDs, only 1 pt is taken off.

2. Common Mistakes

① Sign mistakes in shear and bending moment diagrams. And because of that, the signs in stress are also reversed.

② Didn't know how to solve part (c). Some never tried to find the position of neutral axis, and take $I = I_1 + I_2 = \frac{b_1 h_1^3}{12} + \frac{b_2 h_2^3}{12}$, which is meaningless. Some took the position 1 cm above the bottom as the position of neutral axis.

③ Didn't get I correctly, mostly calculation mistake, which is not bad.

④ Wrong stress diagram. Some students actually didn't understand the beam theory because they didn't even know the distribution should be linear.

Common Errors on Final #5

Part a.

Most students did this problem correctly. The most common errors involved using boundary conditions to evaluate integration constants. In this category, students didn't realize that integration constants were generated as integrals were carried out, A few students had problems finding the general expression for the bending moment as a function of x, not realizing that we provided it for them. Others evaluated it at the mid-point (i.e., immediately plugged in $x = L/2$) and then integrated.

Part b.

Answers on this somewhat unconventional problem varied greatly. Taking the provided hint, most realized that, when the right support dropped down, it meant the column's right half extended out like a cantilever. Arguments were then made that this produced large stresses (both bending stresses and shear stresses were invoked).

However many students had great difficulty in quantifying this basic idea.

Bending moment diagrams were usually drawn incorrectly. In particular, often these figures showed the bending moment starting at some value, rather than being zero at the ends (since no moments act at those points); this is particularly egregious where there isn't even a support since there isn't even a shear force there.

Often students were unsure as to the location of the maximum bending moment, failing to recall that the slope of the M curve is given by the shear force V.

A very common error was to put all of the distributed weight as a single point load at the center of gravity. While this is OK for computing reaction forces, it gave nonsense when trying to generate shear force/bending moment diagrams.