Name: ______________________________

Lab: Tu, W, Th, F

ENES 220 – Mechanics of Materials

Spring 2000

April 12, 2000

MIDTERM EXAM #2

Grading:

Problem 1:	______	/ 33
Problem 2:	______	/ 33
Problem 3:	______	/ 34
Total:	______	/ 100

Policies:

1. Write your name and circle your lab day on all sheets.
2. Use only the paper provided. Ask for additional sheets, if required.
3. Place only one problem on each sheet (front and back).
4. Draw a box around answers for numerical problems.
5. Include free body diagrams (FBDs) for all equilibrium problems.
6. Closed book; closed notes.
7. <u>Show all work used to arrive at your answer in an organized, top-down fashion</u>.

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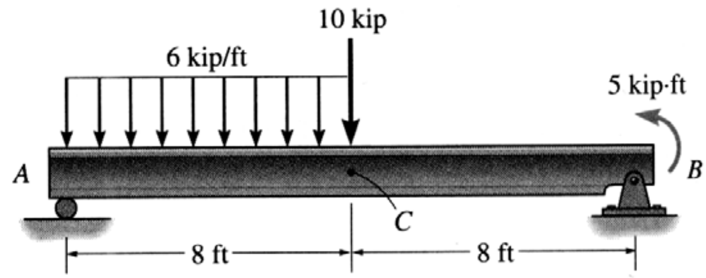
For the beam and loading shown below, draw complete shear and bending moment diagrams. Label all important points.



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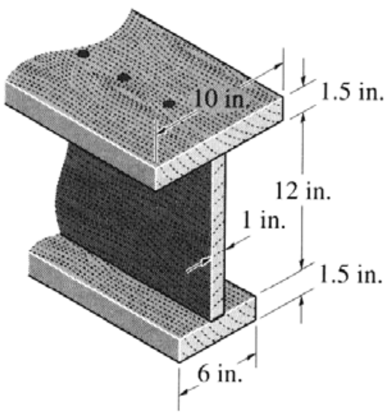
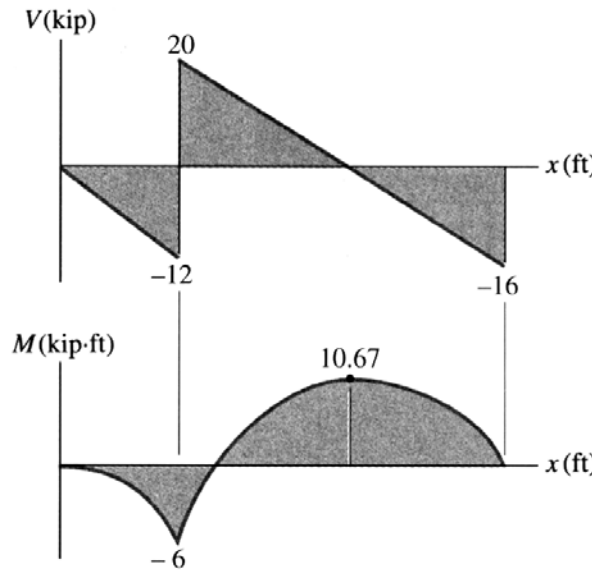
The modified T-beam is constructed by nailing three rectangular boards together. The cross-section of the beam and the shear and bending diagrams for the imposed loading are given below. For this cross-section, I = 1196 in^4, and the neutral axis (NA) is located a distance of 8.625 in from the bottom of the beam. (a) Find the maximum normal stress in the beam. REMEMBER to draw STRESS CUBES for part (a). (b) If each nail can resist a shear force of 1 kip, determine the maximum spacing of nails required for the top and bottom flanges at the location where the shear force is critical. (If the nail spacing for the top and bottom is different, give both values for spacing.)





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A beam is subjected to a concentrated load and a triangular distributed load, as shown below. The beam contains a fixed support at point A (reactions = M_A and R_A) and a roller support at point B (reaction = R_B). Neglect horizontal force components at point A. Assume EI is constant, and place the COORDINATE SYSTEM ORIGIN at point A. (a) Using discontinuity functions, determine an expression for the elastic curve valid throughout the entire beam as a function of M_A, R_A, P, w_o, L, E, and I. (b) Write all boundary conditions (BC's) and the corresponding equations necessary to solve for M_A, R_A, R_B, C_1, and C_2. DO NOT SOLVE THE EQUATIONS.