

Name: _____

Section: 0102 - 0103 - 0104

ENES 220 – Mechanics of Materials

Spring 2001

April 20, 2001

EXAM #2

Grading:

Problem 1: _____ / 25

Problem 2: _____ / 35

Problem 3: _____ / 40

Total: _____ / 100

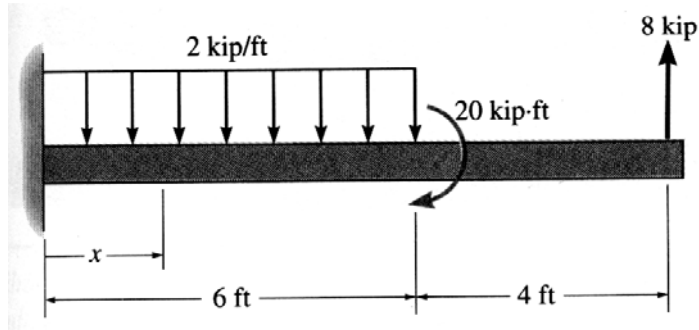
Policies:

1. Write your name and section number 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. Give all answers to 3 or 4 significant figures.
6. Include free body diagrams (FBD's) for all equilibrium problems.
7. Closed book / closed notes; formula sheet permitted.
8. **SHOW ALL WORK USED TO ARRIVE AT YOUR ANSWER.**

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Problem #1 (25 points): The cantilever beam is fixed to the wall at the left end. It is subjected to a uniform distributed load, a concentrated load, and a concentrated moment, at the locations shown.

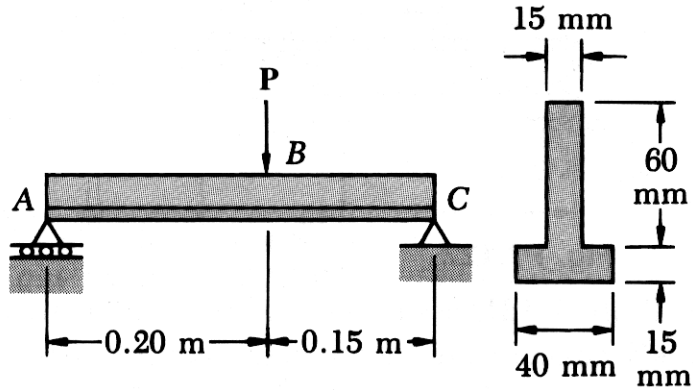


- Draw complete shear and bending moment diagrams for this beam, and label ALL important points.
- Identify the maximum values (absolute) of shear force and bending moment.

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Problem #2 (35 points): The inverted T-beam is simply-supported at A and C and is subjected to a concentrated load P at point B. The cross-section has the dimensions shown below. The material can withstand maximum normal stresses of +100 MPa in tension and -200 MPa in compression, and a maximum shear stress of 50 MPa.

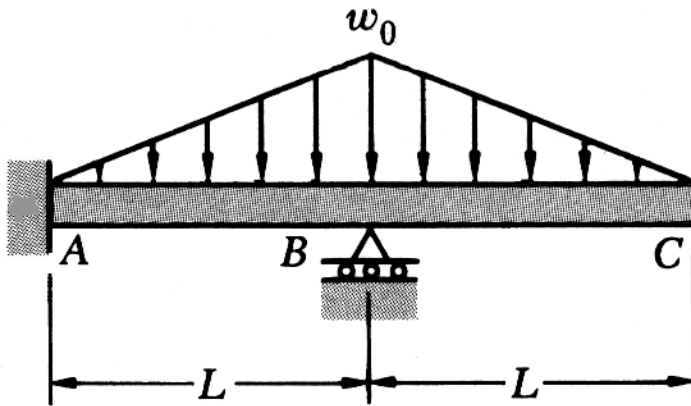


- Find the largest value for P that satisfies all conditions.
- Determine the shear stress at the junction between the web and flange, at the location where the shear force is critical.

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Problem #3 (40 points): A beam is subjected to two triangular distributed loads, as shown below. The beam contains a roller support at B (reaction = B_y) and a fixed support at A (reactions = M_A and A_y). Neglect horizontal force components at A. Assume EI is constant, and place the COORDINATE SYSTEM ORIGIN at point A.



- Find an expression for the elastic curve valid throughout the entire beam as a function of M_A , A_y , B_y , w_0 , L , E , I , and x .
- Determine the support reactions A_y , B_y , and M_A .
- Calculate the slope of the beam at point B.

Give answers to parts (b) and (c) in terms of w_0 , L , E , and I .