ME 323: Mechanics of Materials **Homework 6**

Spring 2024 **Due: February 23, 2024**

Problem 1 (10 points):

A wide-flange beam with an I-shaped cross section is subjected to three concentrated forces as shown in the *figure 1*.

(a) Construct the shear force V(x) and bending moment M(x) diagrams. Mark the critical values on the diagrams.
(b) Determine the flexural stresses at points A and B.
(c) Determine the shear stress at points A and B.
(d) Draw the stress elements to represent the stress states at points A and B.

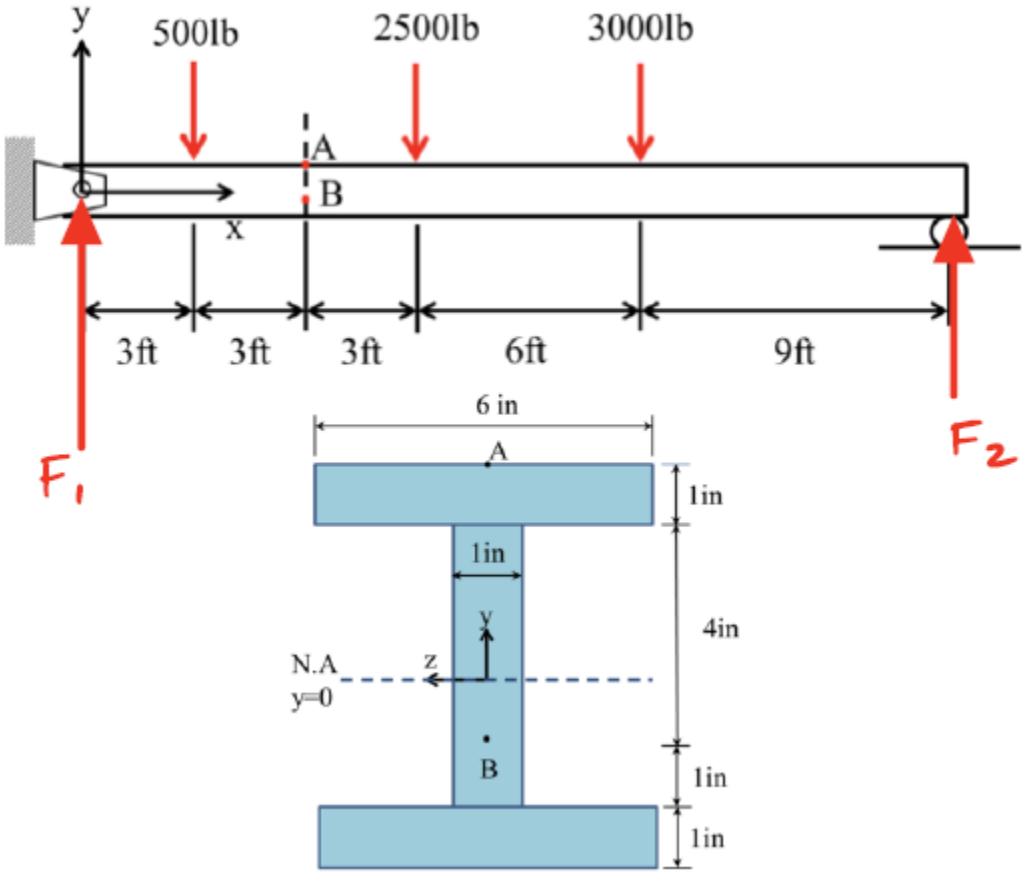


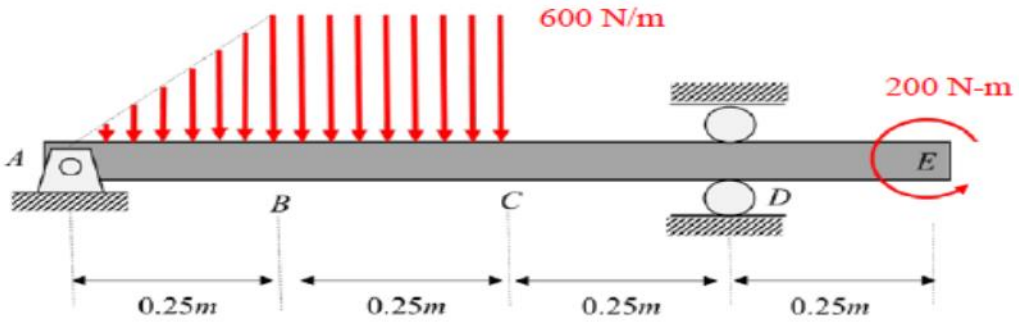
Figure 1: (Top): Wide-flange beam for Problem 1; Bottom: Cross-section of the beam.

Problem 2 (10 points):

Shown in *figure 2* is a beam supported by pin joints at A and D. It is acted upon by a line load that increases uniformly from zero at A to B and maintains a constant value of 600 N/m between B and C. It is also acted upon by a concentrated couple at E.

a) Using the integral approach, determine expressions for shear force V(x) and bending moments M(x) between x = 0m to x = 1 m.

b) Construct shear force and bending moment diagrams using expressions determined in (a).



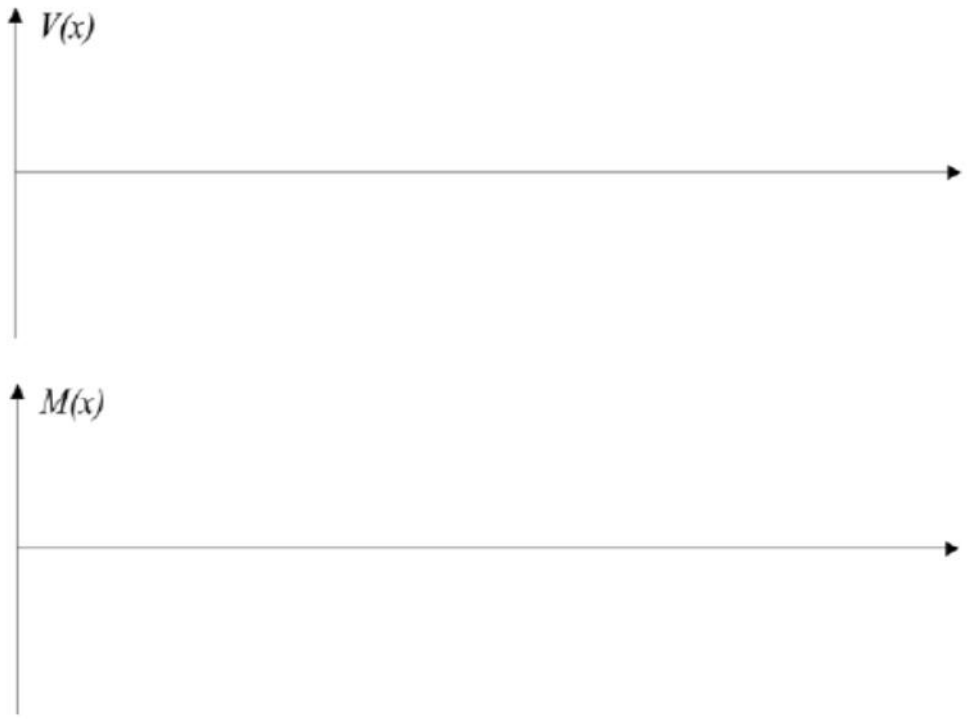


Figure 2: Beam system for Problem 2

Problem 3 (10 points):

For the loading shown in *figure 3*, determine the shearing stress on cross-section n-n at i) point a, ii) point b. [Hint: Use t = 20 mm for both points]

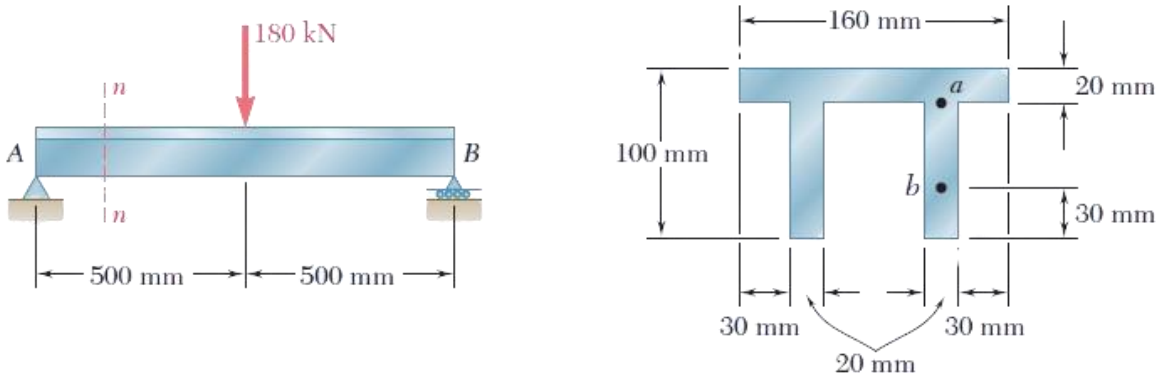


Figure 3: Left: Loading on the beam; Right: Cross section view n-n

Problem 4 (2.5 + 2.5 points):

Identify the schematic that represents the deflection curve of the following beams:

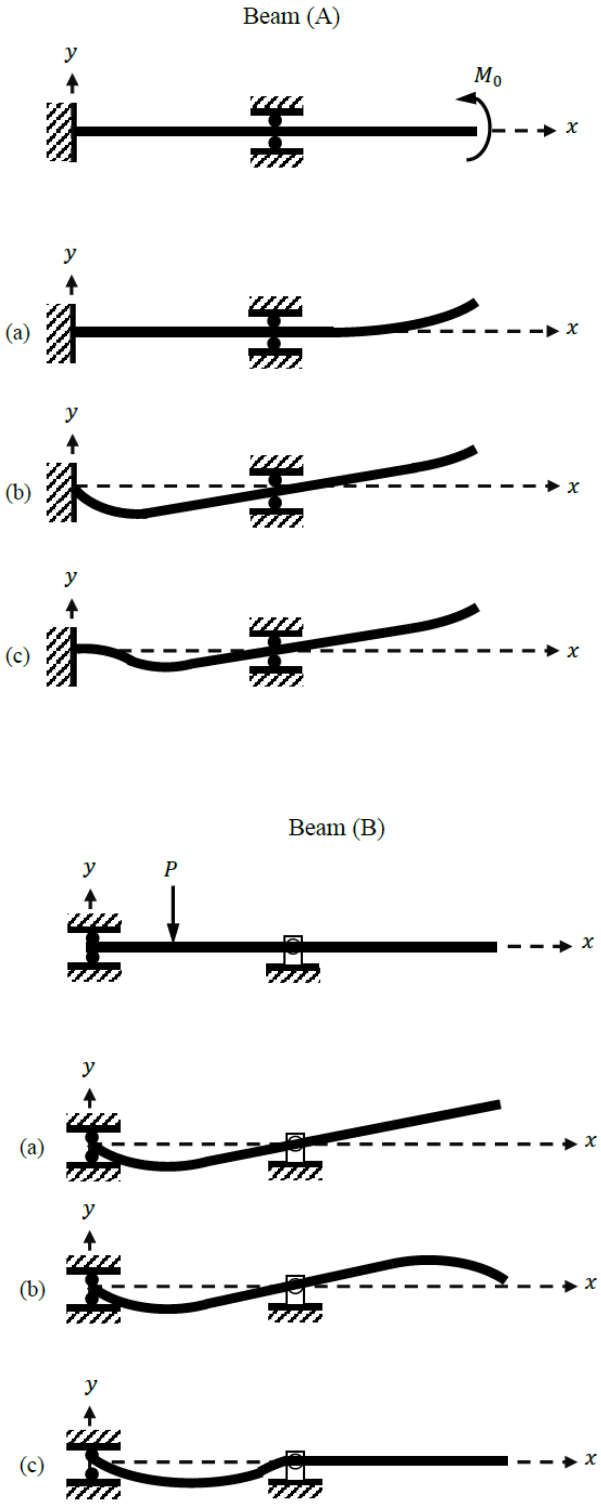


Figure 4: Top: Beam A; Bottom: Beam B.