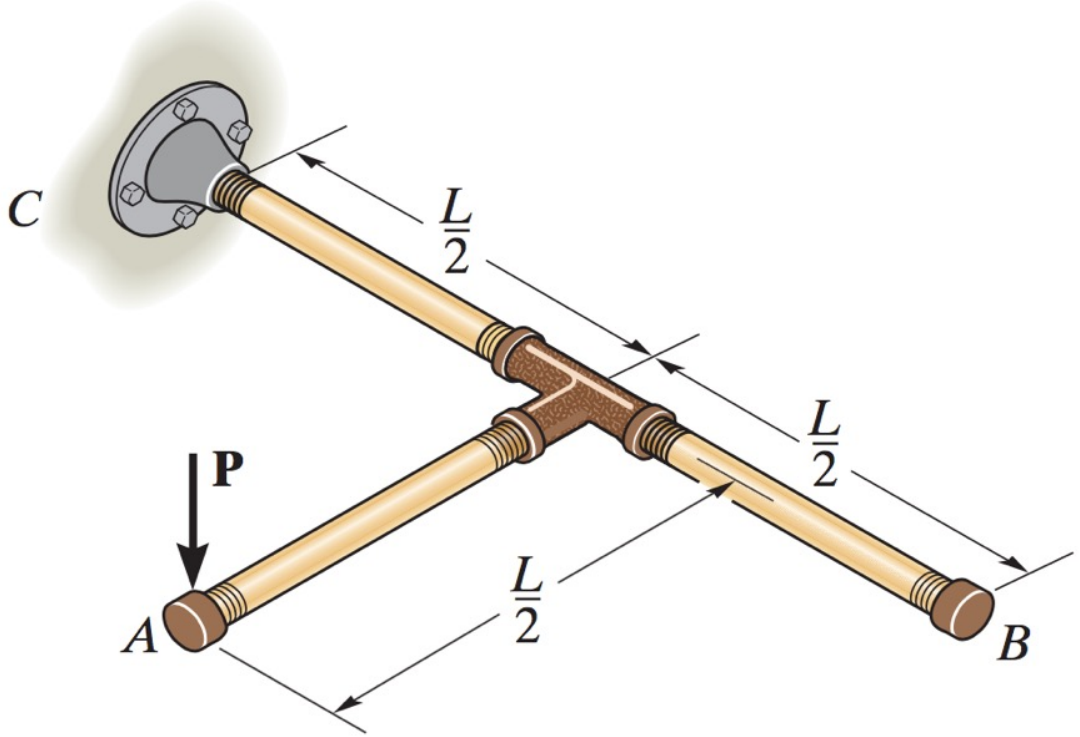
ME 202 Strength of Materials
Spring 2023
Tutorial 6

Mon 13 Feb 2023

Use only the deflection method (and not CT2) to solve problems.

Problem 1



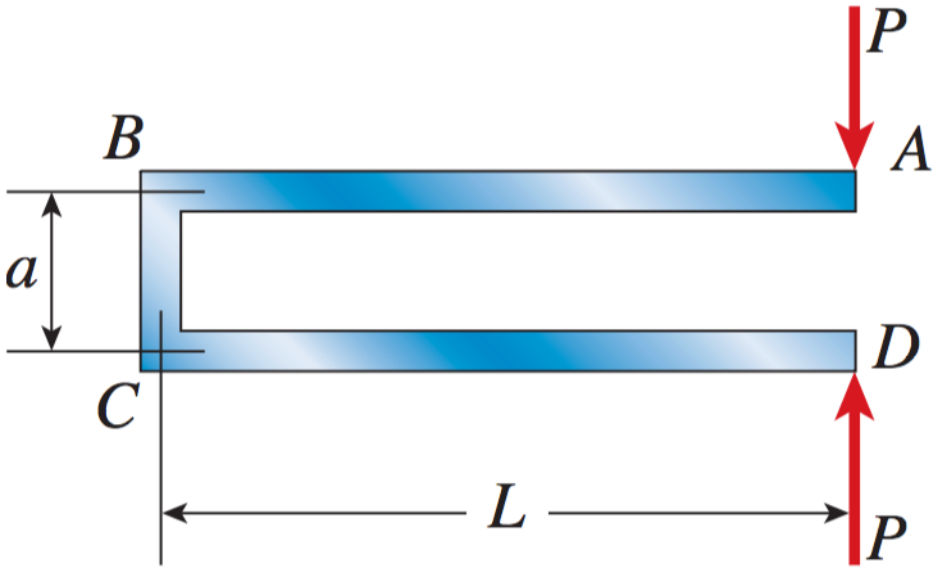
The figure shows three equal length beams (each of length $L/2$) connected as shown below. The assembly is fixed into the wall at C and a vertically downward force P is applied at A.

Calculate the (a) vertical deflection at A (b) vertical deflection at B (c) maximum shear stress in the assembly.

Given elastic modulus E, shear modulus G, second moment of area I, polar moment of inertia J and a solid circular cross-section of diameter D (assume $D << L$).

Ignore the effect of fixtures/connectors.

Problem 2



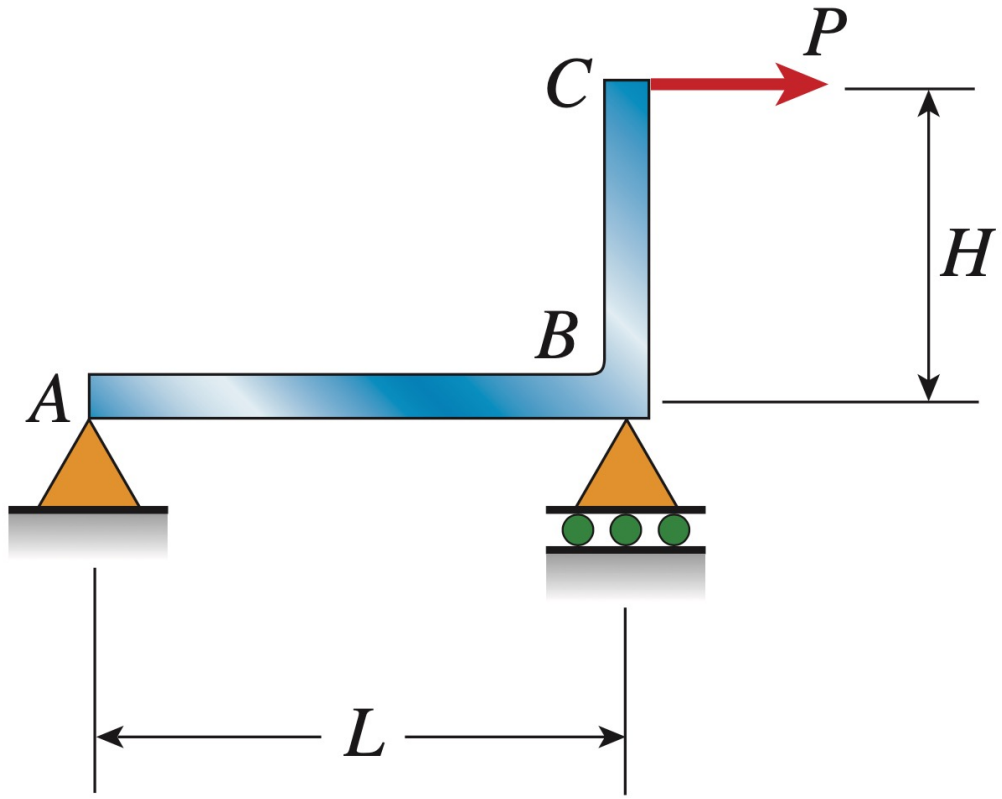
The bent beam ABCD is acted upon equal and opposite forces as shown and acts like a spring.

Find (a) the maximum bending moment in the structure (b) the new distance between A and D after deformation.

Use standard symbols to denote the material and cross-sectional properties of the beam.

Ignore axial deformation (if any).

Problem 3

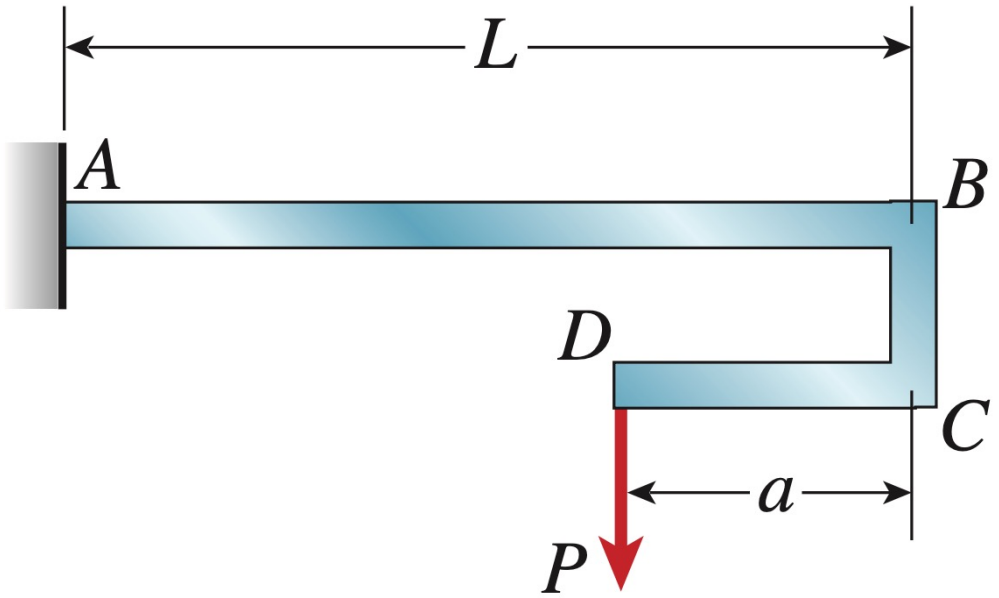


A steel bracket ABC (EI = 4.2E6 Nm^2) with span length L = 4.5 m and height H = 2 m is subjected to load P = 15 kN at C.

Find the maximum horizontal displacement of C.

Ignore axial deformation (if any).

Problem 4



A steel bracket ABCD (EI = 4.2E6 Nm^2), with span length L = 4.5 m and dimension a = 2 m, is subjected to load P = 10 kN at D.

Obtain the maximum deflection at B.

Find *a* such that the deflection at B is zero.

Ignore axial deformation (if any).