16.20

Due: Lecture 39

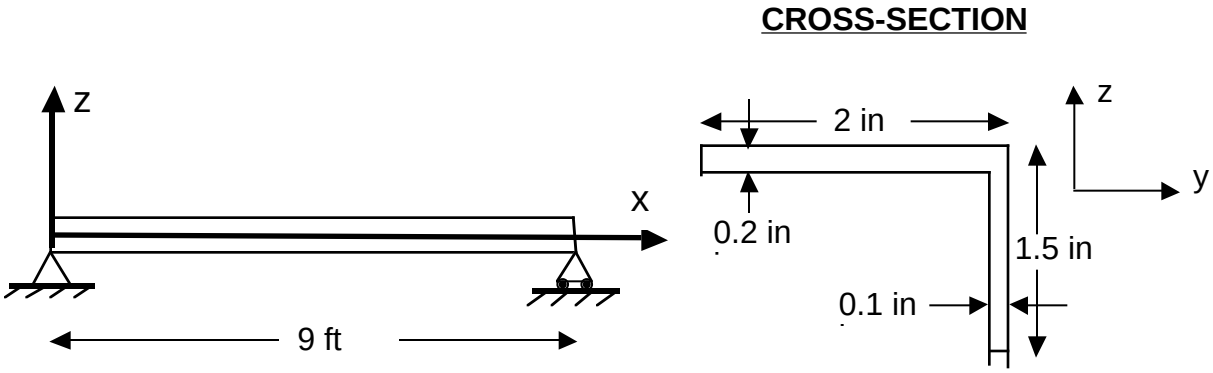
HOME ASSIGNMENT #8 *(Part B)*

Warm-Up Exercises

1. - 7. *in Part A*

Practice Problems

8. A nine-foot long simply-supported beam has an unsymmetric cross-section as shown below. A 220-pound person walks across the beam (assume the weight is applied through the shear center of the beam). The beam is made of steel with a modulus of 30 Msi and a Poisson's ratio of 0.3.



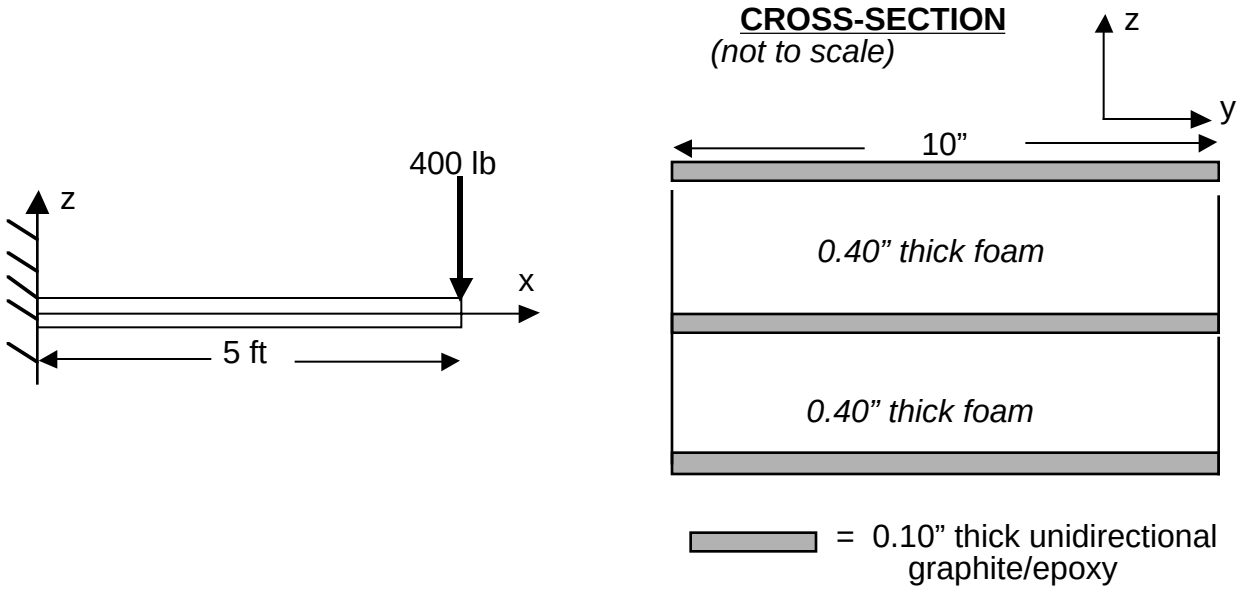
Determine:

(a) the point x along the beam where the person causes the maximum total deflection and the magnitude of that deflection (divide into y- and z-components).

(b) the maximum stress, σ_{xx}, in the beam for this condition and its location.

Application Tasks

9. A new consumer product is made of several alternating layers of 0.10 inch thick unidirectional (0°) graphite/epoxy and 0.40 inch thick styrofoam. The graphite/epoxy has a longitudinal modulus of 22.0 Msi, a transverse modulus of 3.5 Msi, a (transverse) shear modulus of 0.80 Msi, and a major Poisson's ratio of 0.28. The (isotropic) styrofoam has a modulus of 0.50 Msi, and a major Poisson's ratio of 0.35. The application is cantilevered and has a length of 5 feet and width of 10 inches. The loading is a tip load of up to 400 pounds (including a dynamic load factor).



Find:

(a) the maximum stress, σ_{xx}, in the beam and its location.

(b) the through-thickness distribution of the shear stress, σ_{xz}, and its maximum value and location (plot it).

(c) the maximum deflection (and divide this into bending and shearing components).