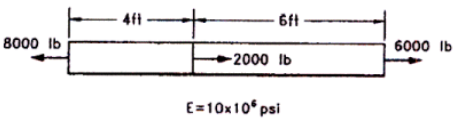
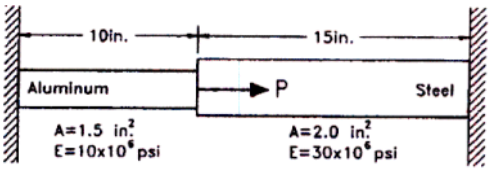
FE Review – Mechanics of Materials

1. An aluminum bar having a constant cross sectional area of 0.25 in^2 carries the axial loads applied at the positions shown. Find the deformation of the bar.
a. 0.0192 in b. 2.880 in c. 0.3264 in d. 0.3840 in e. None of these.

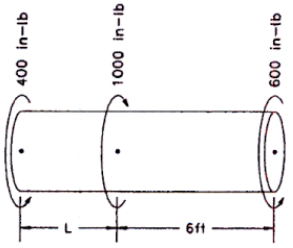


2. A steel rod with a cross sectional area of 0.5 in^2 is stretched between two rigid walls. The temperature coefficient of strain is $6.5x10^{-6}$ in/in./°F and E is $30x10^6$ psi. If the tensile load is 2000 lb. at 80°F, find the tensile load at 0°F.
a. 5800 lb b. 7800 lb c. 8800 lb d. 9800 lb e. 19,600 lb

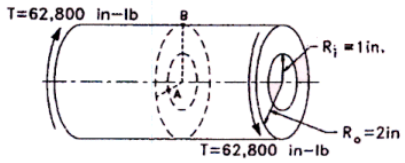
3. The composite bar shown is firmly attached to unyielding supports at the ends and is subjected to the axial load P shown. If the aluminum is stressed to 10,000 psi, find the stress in the steel.
a. 1000 psi b. 2000 psi c. 5000 psi d. 10,000 psi e. 20,000 psi



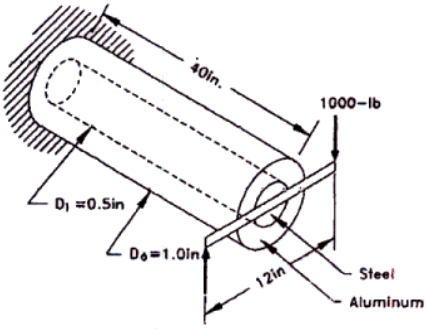
4. Find the length L necessary to make the total angle of twist between the ends of the shaft equal zero.
a. 3 ft b. 4 ft c. 6 ft d. 9 ft e. 12 ft



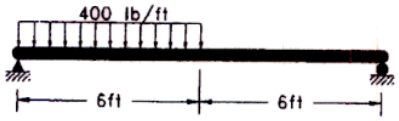
5. Determine the shearing stress at points A and B which are at the inside and outside surfaces of the hollow shaft. Assume elastic behavior.



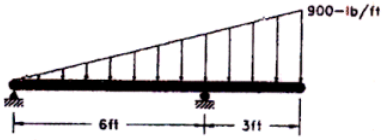
6. A hollow aluminum shaft and a solid steel shaft are rigidly connected at each end. This compound shaft is then loaded as shown. Determine the maximum shearing stress in each material and the angle of twist of the free end. Assume elastic behavior. $G_{aluminum} = 4x10^6$ psi , $G_{steel} = 12x10^6$ psi



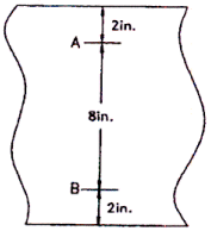
7. Determine the maximum bending moment in the beam.
a. 3600 ft-lb b. 5400 ft-lb c. 7200 ft-lb d. 8100 ft-lb e. 4050 ft-lb



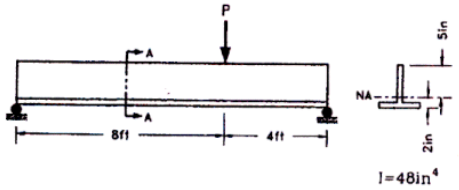
8. Find the maximum transverse shearing force in the beam shown.
a. 450 lb b. 1800 lb c. 2250 lb d. 3600 lb e. 4050 lb



9. By means of strain gages, the flexural stresses are found to be -12,000 psi at A and +4000 psi at B. Assuming the elastic limit of the material has not been exceeded, find the flexural stress at the bottom of the beam.
a. 6000 psi b. 8000 psi c. 9000 psi d. 10,000 psi e. 12,000 psi

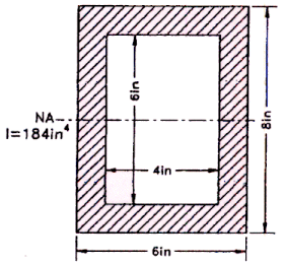


10. For the cast iron beam shown, the maximum permissible compressive stress is 12,000 psi and the maximum permissible tensile stress is 5000 psi. Find the maximum safe load P that can be applied to the beam as shown.
a. 220 lb b. 333 lb c. 1250 lb d. 3000 lb e. 7500 lb

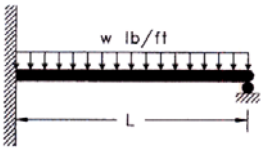


11. A 12-inch, 35-lb I-beam 30 ft. long is supported at 5 ft. from each end and carries a uniform distributed load of 1600 lbs per ft. (which includes its own weight). Determine the maximum flexure stress in the beam.

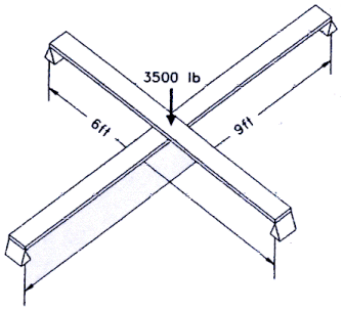
12. Find the maximum vertical shearing force which may be applied to a box beam having the cross section shown without exceeding a horizontal shearing stress of 500 psi.
a. 3065 lb b. 4000 lb c. 6000 lb d. 6130 lb e. 6300 lb



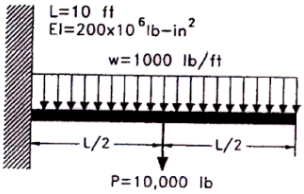
13. Find the reaction at the right end of the beam shown.
a. wL/8 b. wL/4 c. 3wL/8



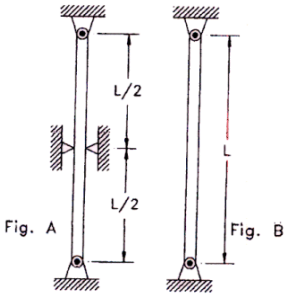
14. Two beams, simply supported at their ends, jointly support a load P = 3500 lb. applied to the upper 6-ft. beam at its midpoint. The beams are identical except for length and cross at their midpoints. Find the load carried by the lower 9-ft. beam.
a. 700 lb b. 800 lb c. 1000 lb d. 1750 lb e. 2700 lb



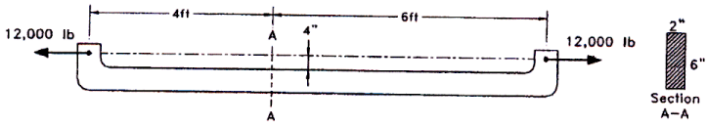
15. Determine the deflection at the end of this beam.



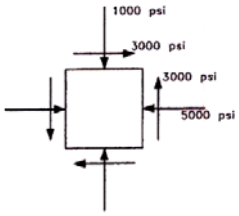
16. The critical Euler load for the pin-ended slender column restrained at the midpoint as shown in Fig. A is 1000 lb. What is the critical Eu1er load for the same column with the midpoint restraint removed as shown in Fig. B.
a. 250 lb b. 500 lb c. 750 lb d. 1000 lb e. 4000 lb



17. A rectangular bar is loaded as shown. Find the maximum tensile stress developed over section A-A.



18. For stress conditions on the element shown, find the principal stresses and the plane on which the maximum principal stress acts.



19. A circular shaft of brittle material subjected to torsion fractures along a 45° angle. Failure is due to what kind of stress?
a. Shearing stress. b. Compressive stress. c. Tensile stress. d. Combined stress. e. None of these.

20. Which bas the higher shear stress for a given elastic torque?
a. a one-inch diameter rod b. a two-inch diameter rod

21. Identical rods of aluminum and steel are each subjected to the same elastic torque. Which rod will have the higher shear stress?
a. steel b. aluminum c. both

22. If G represents the modulus of rigidity (or shear modulus of elasticity), E is the modulus of elasticity, and v is Poisson's ratio, which of the following statements is true for any homogeneous material?
a. G is independent of E. b. G is 0.4E. c. G is 0.5E d. G depends on both E and v. e. None of these.