

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

DEPARTMENT OF OCEAN ENGINEERING

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

13.10J/1.573J Structural Mechanics

Fall 2001

Problem Set 12

Assigned: Nov 21, 2001

Due: Dec 5, 2:30pm , 2001

1. 18.37
2. 18.38
3. 18.39
4. A slender curved circular cross section bar AB with radius of cross section r is welded to the straight cylindrical bar BC with the same radius of cross section as in Figure 1. Young's modulus of elasticity is E for both bars. AB is a quarter of the circle with radius of R . The free end is subjected to a horizontal force P . Determine the horizontal and vertical deflection δ_h , δ_v and the angle of rotation θ at the free end. Use energy method.

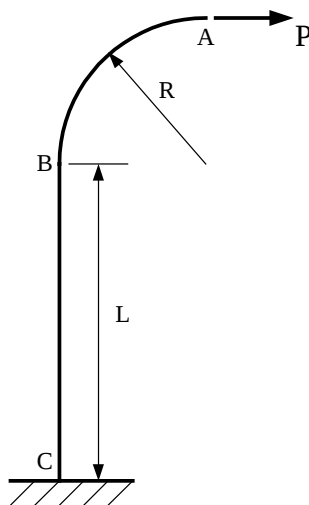


Figure 1

5. A beam ABC (Figure 2) is simply supported at A and B and is hung from a cable CD at point C. Prior to the application of the uniform load q , there is no force in the cable nor is there any slack in the cable. When the load q is applied, the beam deflects downward at C and a tensile force T develops in the cable. Assume the bending rigidity of the beam is EI ; the Young's modulus of the cable material is E ; and the cross sectional area of the cable is A . Using the energy method, show that the magnitude of the tensile force T in the cable is

$$T = \frac{3qAL^4}{8AL^3 + 12hI}$$

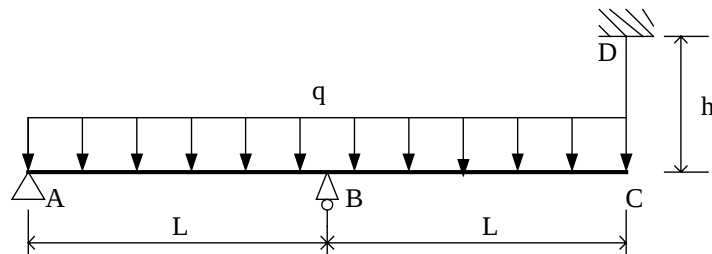


Figure 2