

Chapter 5, Problem 8

Figure P5.8 shows a compound beam with a hinge at C. It is composed of two portions: a beam BC, simply supported at B, and a cantilever AC, fixed at A. Employing Castigliano's theorem, determine the deflection v_D at the point of application of the load P .

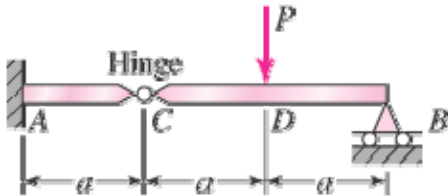
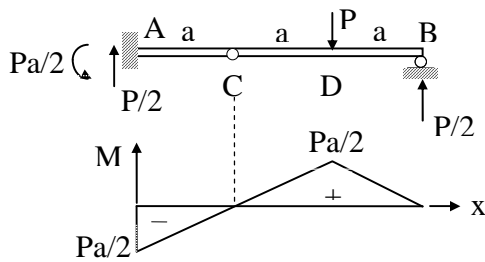


Figure P5.8

Chapter 5, Solution 8



$$M_{AD} = \frac{P}{2}(x - a), \quad M_{BD} = \frac{P}{2}x$$

$$v_D = \frac{1}{EI} \int M_i \frac{\partial M_i}{\partial P} dx$$

$$v_D = \frac{P}{2EI} \left[\int_0^{2a} \frac{(x-a)^2}{2} dx + \int_0^a \frac{x^2}{2} dx \right]$$

Integrating,

$$v_D = \frac{Pa^3}{4EI} \downarrow$$