16–46. The simply supported beam is made of A-36 steel and is subjected to the loading shown. Determine the deflection at its center $C$. $I = 0.1457 \times 10^{-3}$ m$^4$.

**SOLUTION**

Using the table in appendix, the required deflections for each load case are computed as follow:

$$(u_C)_1 = \frac{5wL^4}{768EI} = \frac{5(4)(10^3)}{768EI} \quad \downarrow$$

$$(u_C)_2 = \frac{PL^3}{48EI} = \frac{20N(10^3)}{48EI} = \frac{416.67 \text{ kN} \cdot \text{m}^3}{EI} \quad \downarrow$$

Then the deflection of point C is

$$v_C = (u_C)_1 + (u_C)_2$$

$$= \frac{260.42}{EI} + \frac{416.67}{EI}$$

$$= \frac{677.08 \text{ kN} \cdot \text{m}^3}{EI} \quad \downarrow$$

$$= 0.1457 \times 10^{-3} \text{ m}^4$$

and $E = 200 \text{ GPa}$

$$\Delta_C = \frac{677.08 \times 10^{-3}}{200(10^3) \times 0.1457 \times 10^{-3}} = 0.0232 \text{ m} \quad \downarrow$$

**Ans.**