

Answer on Question #54204-Engineering-Mechanical Engineering

What is the critical load for a strut of length 4.0 m and flexural rigidity 28 MPa if both ends are fixed?

A. 80.80 MN B. 79.14 MN C. 69.10 MN D. 88.90 MN E. None of the above

Solution

The critical load is, in general,

$$F_c = \frac{\pi^2 EI}{L_e^2},$$

where E is the modulus of elasticity, I is the moment of inertia, L_e is the effective length.

Both ends are fixed, so the effective length is $\frac{L}{2} = 2.0 \text{ m}$.

The critical load is

$$F_c = \frac{\pi^2 \cdot 28 \cdot 10^6 \text{ Pa}}{(2.0 \text{ m})^2} = 69.10 \text{ MN.}$$

Answer: C. 69.10 MN.