
Description:

Natural frequency of a cantilevered beam with a weight at the top.

Material properties:

$$E := E_s \quad E = 29000.00 \text{ ksi}$$

$$\text{Moment of Inertia: } I := 2000 \text{ in}^4$$

Geometry:

$$\text{Cantilevered Beam: Length: } L := 10 \text{ ft}$$

Loading:

$$\text{Distributed weight of cantilevered arm: } w := 900 \frac{\text{lbf}}{\text{ft}}$$

$$\text{Concentrated Load at the end of the cantilever: } W := 2000 \text{ kips}$$

Design:

$$\text{Angular frequency: } \omega := \sqrt{\frac{3 \cdot E \cdot I \cdot g}{W \cdot L^3 + \frac{33}{140} \cdot w \cdot L^4}} \quad \omega = 4.4 \text{ Hz}$$

$$\text{First Natural Frequency: } f := \frac{\omega}{2\pi} \quad f = 0.7 \text{ Hz}$$