Description:

Natural frequency of a cantilevered beam with a weight at the top. Ref: Paz Ex 6.4 and Roarke Table 36.

Material properties:

$E := E_s$ $E = 29000.00 \, ksi$

Moment of Inertia: $I := 2000 \, in^4$

Geometry:

Cantilevered Beam: Length: $L := 10 ft$

Loading:

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

Concentrated Load at the end of the cantilever: $W := 2000 \, kips$

Design:

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

First Natural Frequency: $f := \dfrac{\omega}{2\pi}$ $f = 0.70 \, Hz$

Cantilever.mcd