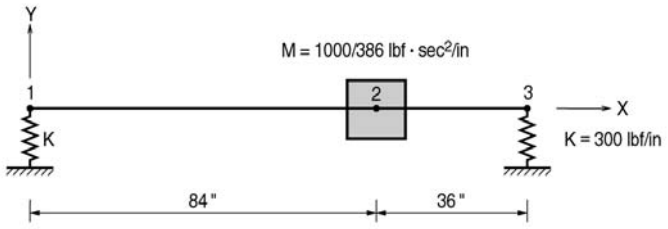
Eigen-2

Title

Simple beam with a lumped mass supported on two springs

Description

Calculate the natural period of free vibration of a beam with a lumped mass.



Structural geometry

MODEL

Analysis Type

2-D eigenvalue analysis (X-Y plane)

Unit System

in, lbf

Dimension

Length L = 120 in

Spring constant K = 300 lbf/in

Element

Beam element

Material

Modulus of elasticity $E = 30 \times 10^6$ psi

Section Property

Moment of inertia Iyy = 1.0 in^2

Boundary Condition

Nodes 1, 2 and 3 ; Constrain Dx

Nodes 1 and 3 ; Y spring constant = 300 lbf/in

Analysis Case

A lumped mass, M = 1000/386 $lbf \cdot sec^2/in$ exists at the node 2.

Results

Eigenvalue Analysis Results

EIGENVALUE ANALYSIS												
	Mode No	Frequency (rad/sec)		Frequency (cycle/sec)		Period (sec)		Tolerance				
	1	11,783312		1,875372		0,533227		2,0470e-016				
MODAL PARTICIPATION MASSES(%) PRINTOUT												
	Mode No	TRAN-X		TRAN-Y		TRAN-Z		ROTN-X		ROTN-Y		ROTN-Z
		MASS	SUM	MASS	SUM	MASS	SUM	MASS	SUM	MASS	SUM	MASS	SUM
	1	0,00	0,00	100,00	100,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
EIGENVECTOR													

Comparison of Results

Unit : psi

Result	Theoretical	STAAD/PRO	MIDAS/Civil
Natural period	0.533	0.533	0.533

References

Timoshenko, Young and Weaver, *"Vibration Problems in Engineering*", 4th Edition , p. 11, Problem 1.1-3.

"*STAAD-III/ISDS, Getting Started and Example Manual"*, Research Engineers, Inc.,1994,Verification problem No.2.