

---

# Natural frequencies of a rotating curved cantilever beam: A perturbation method based approach

Journal Title  
XX(X):1–3  
©The Author(s) 0000  
Reprints and permission:  
sagepub.co.uk/journalsPermissions.nav  
DOI: 10.1177/ToBeAssigned  
www.sagepub.com/

SAGE

Ajinkya Baxy<sup>1</sup> and Abhjit Sarkar<sup>1</sup>

A sample APDL code for modal analysis of a rotating curved cantilever beam is given below. Following are the properties of the beam:

1. width: 0.1 m
2. thickness: 0.2 m
3. length: 4 m
4. hub radius: 0 m
5. opening angle: 40°
6. Young's modulus:  $200 \times 10^9 \text{ N-m}^{-2}$
7. density:  $7850 \text{ kg-m}^{-3}$
8. non-dim. rotating speed: 1.5

FINISH  
/CLEAR

/TITLE, Modal analysis of a rotating curved cantilever beam

---

<sup>1</sup>Mechanical Engineering Department, Indian Institute of Technology, Madras

**Corresponding author:**

Dr. Abhjit Sarkar, Machine Design Section, Mechanical Engineering Department, IIT Madras, Chennai, India

Email: asarkar@iitm.ac.in

```

/PREP7

MP,EX,1,200E9 ! Young's modulus
MP,PRXY,1,0.3 ! Poisson's ratio
MP,DENS,1,7850 ! Density

ET,1,beam189,,1, ! Element definition
SECTYPE,1,BEAM,RECT,, ! Section type
SECDATA,0.1,0.1,, ! thickness and width

K,1,0.000000,5.729578 ! Keypoints in cartesian coordinate system
K,2,3.6831,4.3891
K,3,0,0
LARC,1,2,3, 5.729,
CSYS,1 ! Transform to cylindrical coordinate system
LESIZE,ALL,,200 ! mesh
LMESH,1

nplo
nrot,all

alls
eplo

D,1, , , , ,ALL, , , , , ! Cantilever boundary condition
FINISH
/SOLU

ANTYPE,0 ! Static Analysis with pre-stress

CSYS,0 ! Cylindrical coordinate system
omega,0,13.660,0 ! Use omega,0,0,0 for stationary curved beam

pstr,on ! pre-stress ON

solve

fini
/solu

CSYS,1 ! Cartesian coordinate system
ANTYPE,2 ! Modal analysis
MODOPT,SUBSP,25
EQSLV,FRONT
MXPAND,25

pstr,on

SOLVE
FINISH

```

---

```
/POST1 ! post processing  
SET,FIRST  
PLDISP,1
```