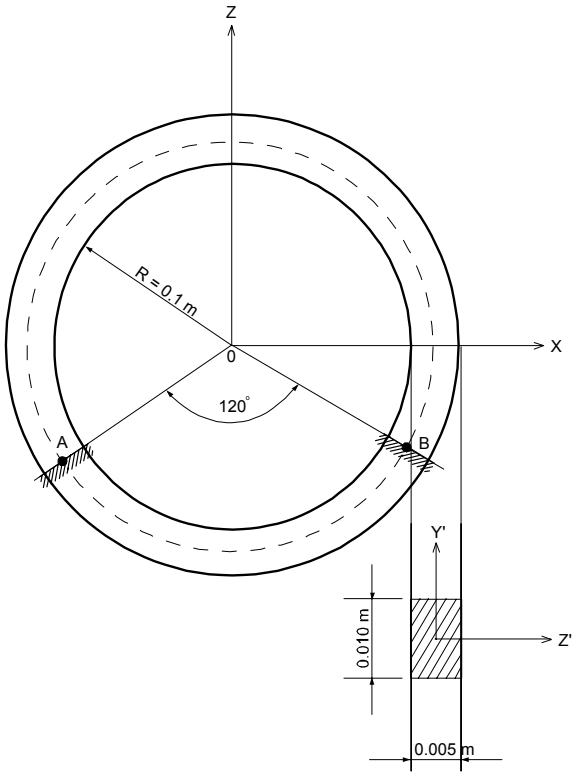
# Eigen-17

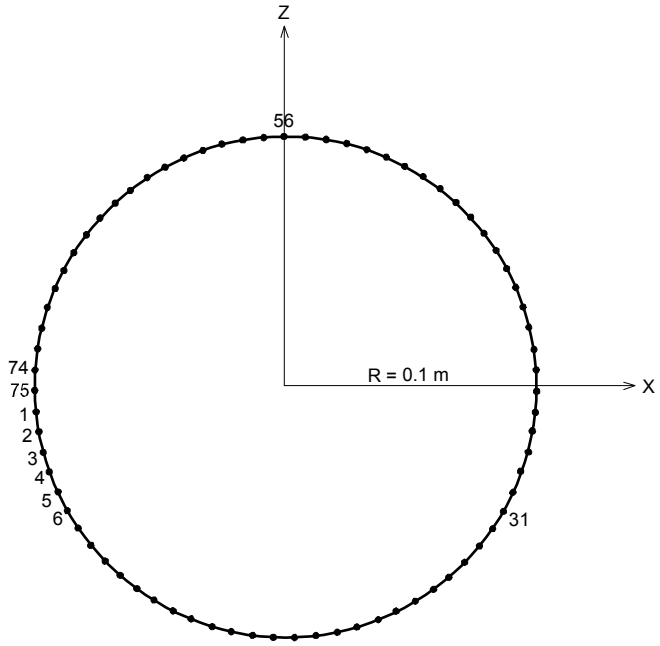
## Title

Eigenvalue analysis of a slim circular ring fixed by 2 points

## Description

Determine the first 4 frequencies and mode shape.






*Structural geometry and analysis model*

# MODEL

***Analysis Type***

2-D eigenvalue analysis

***Unit System***

m, N

***Dimension***

Radius 0.1 m

***Element***

Beam element

***Material***

Modulus of elasticity $E = 7.2\times10^{10}$ Pa
Poisson's ratio $\nu = 0.3$
Weight density $\gamma = 2700$ kgf/m$^3$

***Sectional Property***

Rectangular cross-section: b = 0.010 m, h = 0.005 m

***Boundary Condition***

Node 6, 31: Constrain $D_X$, $D_Z$ and $R_Y$

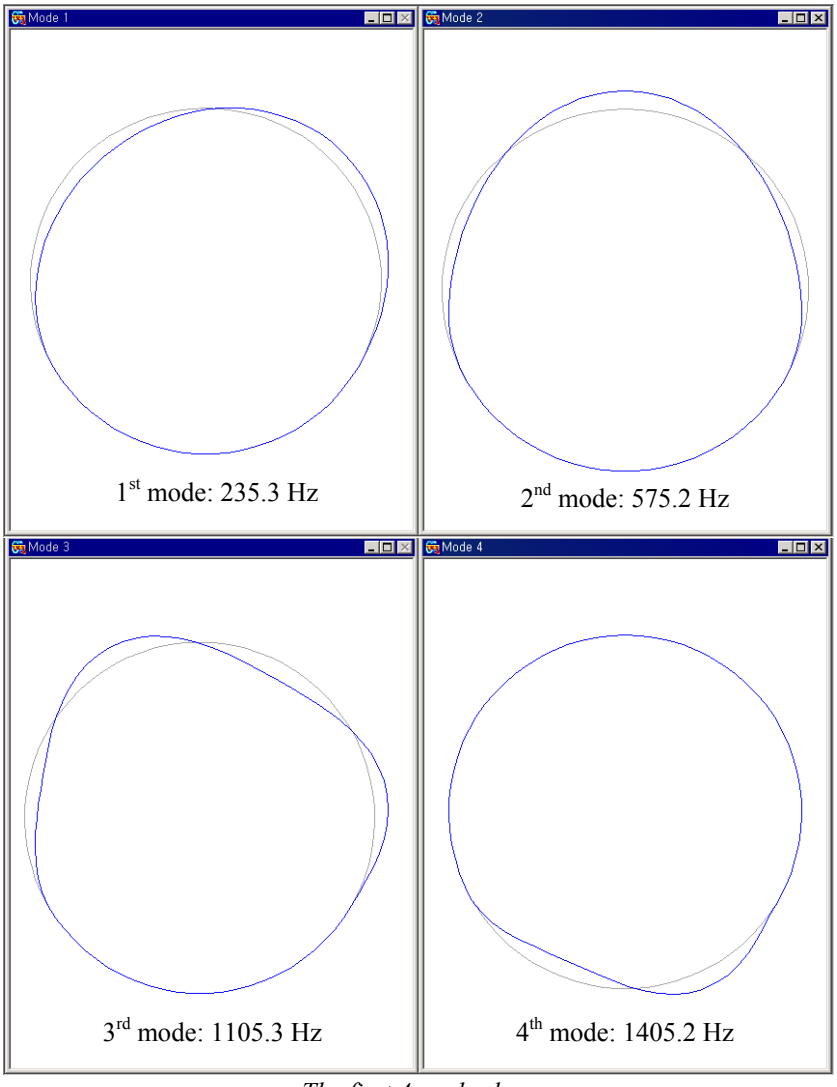
***Analysis Case***

Eigenvalue analysis

## Results

| EIGENVALUE ANALYSIS | | | | | |
|---|---|---|---|---|---|
| Mode No | Frequency (rad/sec) | Frequency (cycle/sec) | Period (sec) | Tolerance | |
| 1 | 1478,5 | 235,3 | 0,0 | 4,2607e-016 | |
| 2 | 3614,0 | 575,2 | 0,0 | 0,0000e+000 | |
| 3 | 6944,7 | 1105,3 | 0,0 | 6,1794e-016 | |
| 4 | 8829,1 | 1405,2 | 0,0 | 1,9115e-016 | |

*The first 4 frequencies*




*The first 4 mode shapes*

## Comparison of Results

Unit: Hz

| Result | mode | Theoretical | MIDAS/Civil |
|---|---|---|---|
| Frequency | 1st | 235.3 | 235.3 |
| | 2nd | 575.3 | 575.2 |
| | 3rd | 1105.7 | 1105.3 |
| | 4th | 1405.6 | 1405.2 |

## Reference

P. Dellus, "*Résistance des matériaux*", Paris, Technique et Vulgarisation, 1958