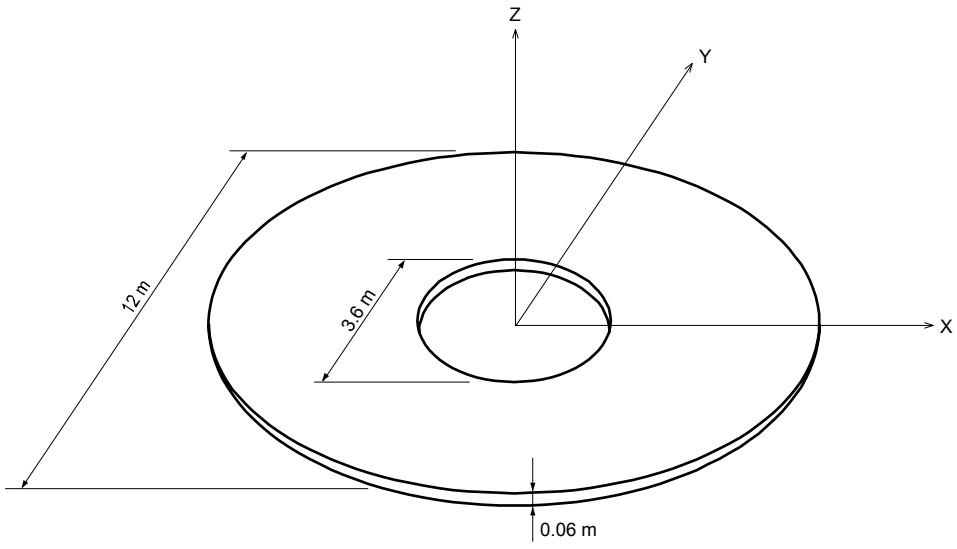
Eigen15

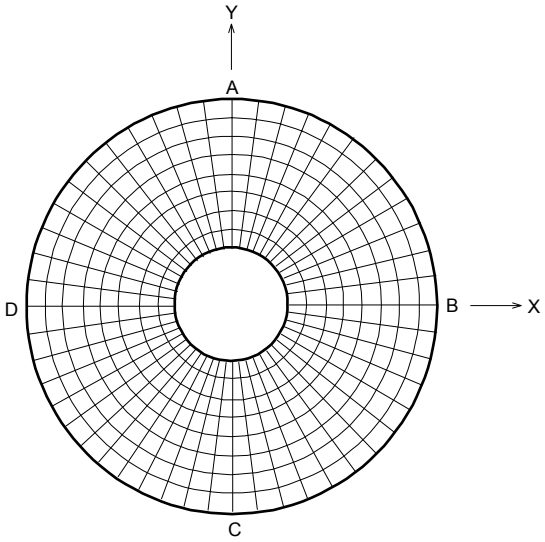
Title

Eigenvalue analysis of simply supported thin annular plate

Description

A simply supported thin annular plate is analyzed to determine the first 10 natural frequencies.
Determine the natural frequencies and mode shapes.





Structural geometry and analysis model

MODEL

Analysis Type

3-D eigenvalue analysis

Unit System

m, N

Dimension

Outer diameter 12 m Inner diameter 3.6 m

Element

Plate element

Material

Modulus of elasticity $E = 200\times10^9$ Pa

Poisson's ratio $\nu = 0.3$

Density $\gamma = 8000$ kgf/m^3

Sectional Property

Thickness 0.06 m

Boundary Condition

Node A~B~C~D: Constrain D_X, D_Y and D_Z

Analysis Case

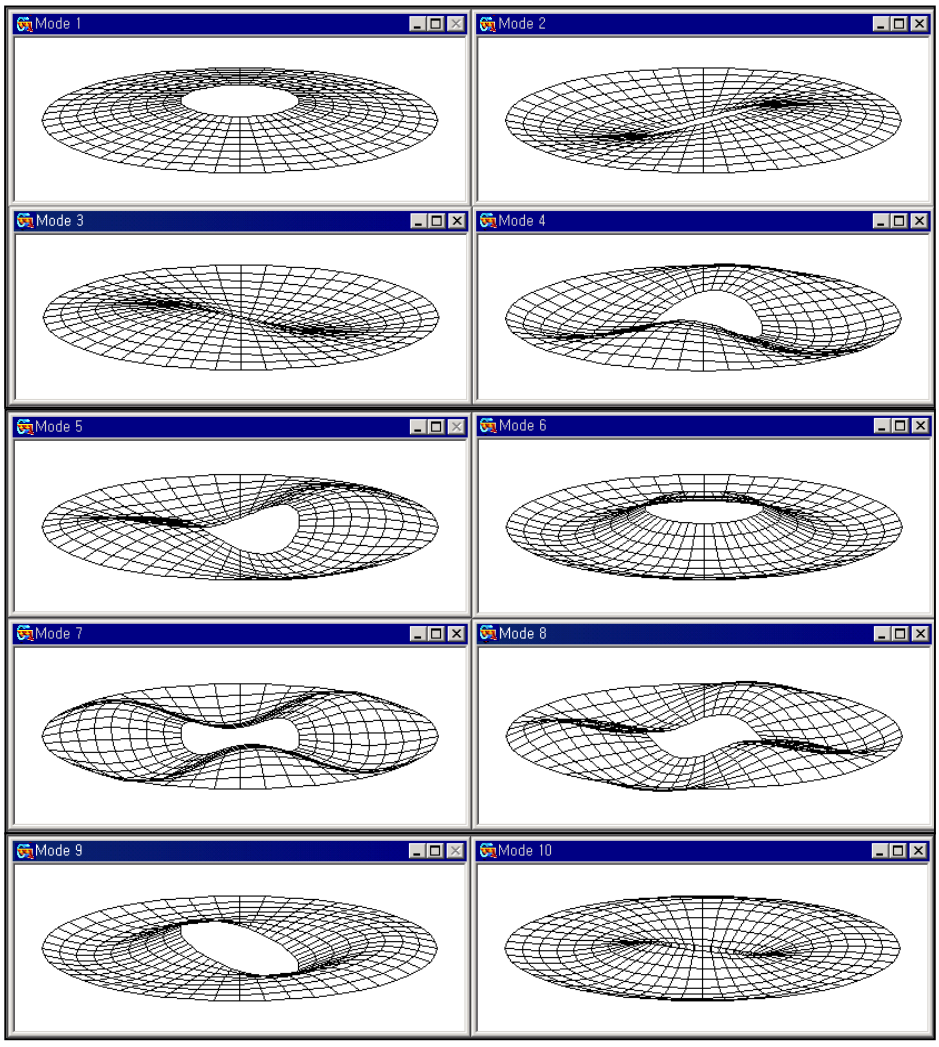
Eigenvalue analysis

Results

EIGENVALUE ANALYSIS

Mode No	Frequency (rad/sec)	Frequency (cycle/sec)	Period (sec)	Tolerance
1	11,671	1,857	0,538382	6,2603e-016
2	32,304	5,141	0,194503	6,5366e-016
3	32,304	5,141	0,194503	1,9610e-015
4	60,683	9,658	0,103541	1,4819e-015
5	60,683	9,658	0,103541	1,1114e-015
6	90,917	14,470	0,069109	1,1003e-015
7	97,132	15,459	0,064687	1,1568e-015
8	97,132	15,459	0,064687	1,9280e-016
9	112,930	17,973	0,055638	7,1316e-016
10	112,930	17,973	0,055638	2,8526e-016

the first 10 natural frequencies



the first 10 mode shapes

Comparison of Results

Unit: Hz

Results	Mode	Theoretical	MIDAS/Civil
Frequency	1st	1.870	1.857
	2nd , 3rd	5.137	5.141
	4th , 5th	9.673	9.658
	6th	14.850	14.470
	7th , 8th	15.573	15.459
	9th , 10th	18.382	17.973

Reference

NAFEMS. (1989). "*The Standard NAFEMS Benchmarks*", Rev. No TSNB, National Engineering Laboratory, E. Kilbride, Glasgow, UK.