SDLS102 - Free vibrations of a paddle of compression

Summarized:

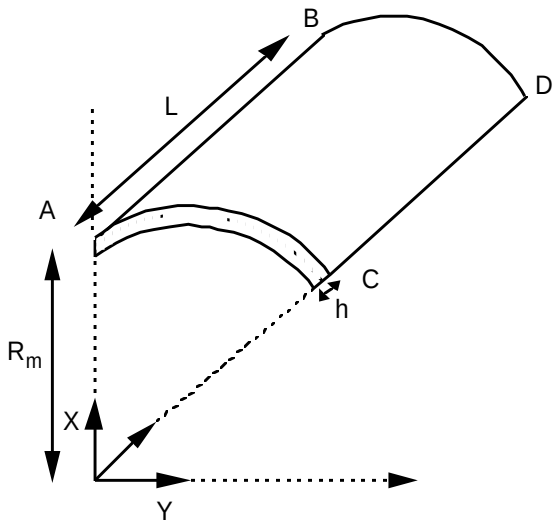
This test makes it possible to by means of validate the computation of the eigenfrequencies of a paddle of compression command MODE_ITER_INV.

The modelizations correspond to the use of elements COQUE_3D MEC3QU9H (modelization A) and MEC3TR7H (modelization B).

The reference solutions are experimental results. The difference between the numerical results and the experimental values does not exceed $4,5\%$ for the two modelizations.

1 Problem of reference

1.1 Geometry



It acts of a cylindrical panel:

Length: $L=0.3048\,m$,
Average radius: $R_m=0.6096$,
Length of arc: $0.3042\,m$,
Thickness: $h=0.003048\,m$.

1.2 Properties of the material

the material is homogeneous, isotropic, elastic linear. The elastic coefficients are:

$E=206\,850.\,MPa$
$\nu=0.3$

Density: $\rho=7857{,}2\,kg/m^3$
Coefficient of the shear deformations: $\mathrm{A\_CIS}=0.8333$

1.3 Boundary conditions and loadings

the structure is embedded at the end BD .

2 Reference solution

2.1 Method of calculating used for the reference solution

the reference solution corresponds to the experimental measurements given in [bib1].

2.2 Results of reference

the first six measured eigenfrequencies.

Number of the mode	experimental Values
1	85.6
2	134.5
3.259	
4.351	
5.395	
6.531	

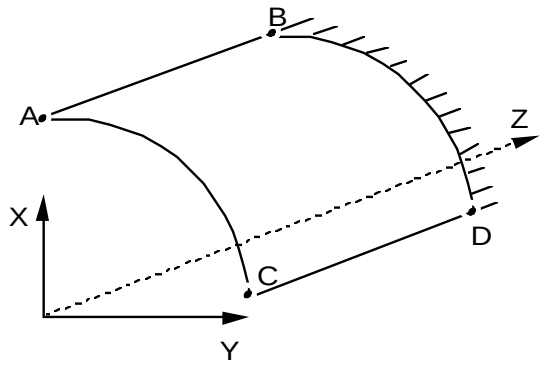
2.3 bibliographical References

1) J.L. BATOZ, G. DHATT: Modelization of structures by finite elements - Volume 3 shells, 1992 HERMES pp 467 to 470.

3 Modelization A

3.1 Characteristic of the modelization

Coque 3D MEC3QU9H



3.2 Characteristics of the mesh

Many nodes: 169, Number of meshes and types: 36 QUAD9

3.3 Functionalities tested

One search the frequencies in the interval $(80.,570.)$ the option by means of "ADJUSTS" under the key word factor CALC_FREQ of the command MODE_ITER_INV.

3.4 Quantities tested and results

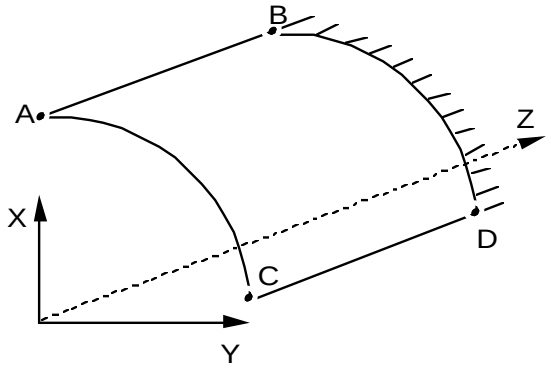
(Frequencies in Hertz)

Identification n° mode	Reference	*Aster*	% difference
1	85.6	85.85	0.302
2	134.5	138.56	3.021
3.259		246.92	– 4.664
4.351		342.71	– 2.361
5.395		386.66	– 2.112
6.531		531.59	0.112

4 Modelization B

4.1 Characteristic of the modelization

Coque 3D MEC3TR7H



4.2 Characteristics of the mesh

Many nodes: 913, Number of meshes and types: 288 TRIA7

4.3 Quantities tested and results

(Frequencies in Hertz)

Identification n° mode	Reference	*Aster*	% difference
1	85.6	86.06	0.534
2	134.5	138.68	3.112
3.259.248			– 4.246
4.351		344.52	– 1.845
5.395		390.62	– 1.108
6.531		533.2	0.415

5 Summary of the results

the results are satisfactory. But the mesh with elements MEC3TR7H must be fine to have the same level of error as that obtained with elements MEC3QU9H.