SDLX01 - Bending of a Summarized symmetric

gantry:

This plane problem consists in seeking the frequencies of vibration of a mechanical structure made up of an assembly of beams with rectangular section (symmetric gantry). This test of structural mechanics corresponds to a dynamic analysis of an assembled structure having a linear behavior. It understands only one modelization.

Via this problem, one tests the beam element of Timoshenko as well as the computation of the frequencies of vibration by the method of the inverse iterations.

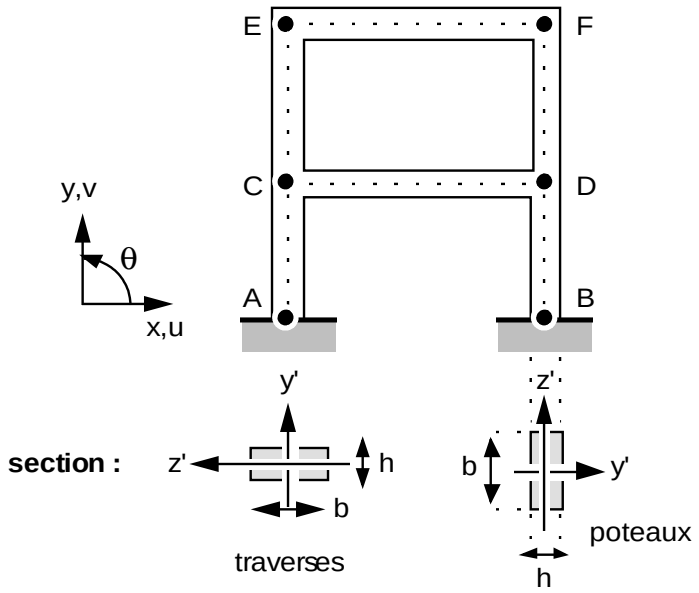
The got results are in very good agreement with those of guide VPCS. The error on the first thirteen frequencies of vibration is lower than 0,2%.

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

Licensed under the terms of the GNU FDL (http://www.gnu.org/copyleft/fdl.html)

1 Problem of reference

1.1 Geometry



Sections droites rectangulaires :

épaisseur	h = 0.0048 m
largeur	b = 0.029 m
aire	A = 1.392 10^{-4} m^2
inertie	Iz = 2.673 10^{-10} m^4

Coordinated of the points (in meters):

	A	B	C	D	E	F
x	– 0.30	0.30	– 0.30	0.30	– 0.30	0.30
y	0.	0.	0.36	0.36	0.81	0.81

1.2 Material properties

$E = 2.1\,10^{11}\,Pa$

$\nu = 0.3$

$\rho = 7\,800.\,kg/m^3$

1.3 Boundary conditions and loadings

Points A and B : embedded ($u = v = 0$, $\theta = 0$).

1.4 Initial conditions

Without object for the modal analysis.

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

Licensed under the terms of the GNU FDL (http://www.gnu.org/copyleft/fdl.html)

2 Reference solution

2.1 Method of calculating used for the reference solution

the reference solution is that given in file SDLX01/89 of the guide VPCS which presents the method of calculating in the following way:

Method of the dynamic stiffness (Theory of the slender beams)

2.2 Results of reference

the first 13 eigenfrequencies.

2.3 Uncertainty on the solution

$(\Delta f / f) < 0.5\ \%$.

2.4 Bibliographical references

•J. PIRANDA. Course and Directed Works of vibrations of structures. Mechanical option. École Nationale Supérieure of Mechanics and Micromechanics. Laboratory of Mechanics Applied. Besancon (France) (1983).

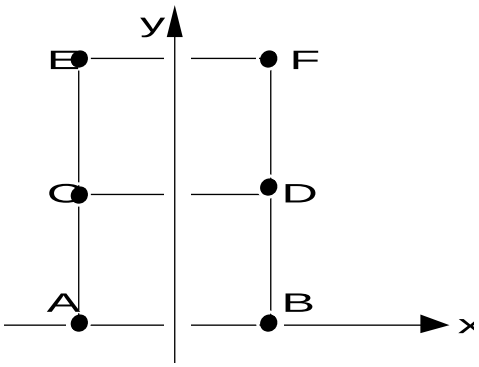
Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

Licensed under the terms of the GNU FDL (http://www.gnu.org/copyleft/fdl.html)

3 Modelization A

3.1 Characteristic of modelization

POU_D_T



Cutting: AC and BD 6 meshes limiting
CE SEG2 DF and 9 meshes
CD SEG2 EF and 10 meshes

SEG2 Conditions:

problem plane DDL_IMPO: (TOUT: "OUI' DZ: 0. , DRX: 0. , DRY: 0.)

nodes A and B clamped (GROUP_NO: AB DX: 0. , DY: 0. , DRZ: 0.)

Name of the nodes:

$Point\ A = N100$ $Point\ B = N600$
$Point\ C = N200$ $Point\ D = N500$
$Point\ E = N300$ $Point\ F = N400$

3.2 Characteristics of the mesh

Many nodes: 50
Number of meshes and types: 50 SEG2

3.3 Values tested

Identification	anti
Reference 1	8.8
2 anti	29.4
3 sym	43.8
4 anti	sym
56.3 5	96.2
6 anti	sym
102.6 7	147.1
8 anti	sym

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

Licensed under the terms of the GNU FDL (http://www.gnu.org/copyleft/fdl.html)

174.8 9	178.8
10 anti	206.0
11 anti	sym
266.4 12	320.0
13 sym	335.0

3.4 Remarks

Computations carried out by:

```
      MODE_ITER_INVOPTION    : LIST_FREQ "ADJUSTS": (5. , 350.) NMAX_FREQ:
13
```

3.5 Contents of the file results

the first 13 eigenfrequencies (modal eigenvectors and parameters).

4 Summary of the Accuracy

results lower than 0.2% on all the eigenfrequencies until the 13th mode.

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

Licensed under the terms of the GNU FDL (http://www.gnu.org/copyleft/fdl.html)