SSLV301 - Cylindrical beam comforts under load linearly distributed

Summarized:

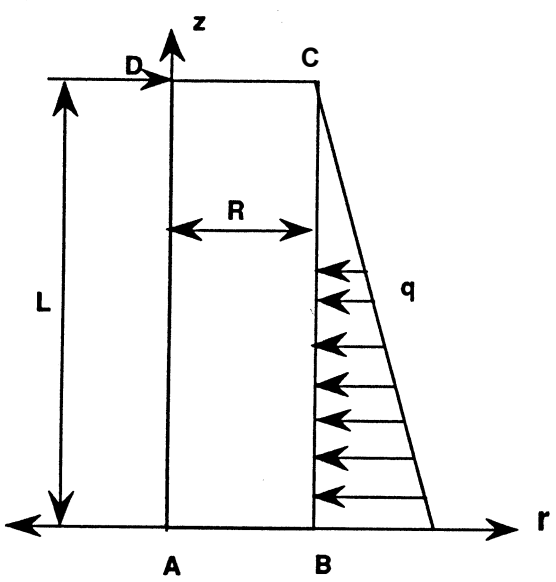
The goal of the test is to validate a load linearly distributed, from an analysis 2D with decomposition in Fourier series of the load.

2 computations here are carried out:

1) a computation with the first 2 modes (0 and 1),
2) a computation with the first 10 modes.

1 Problem of reference

1.1 Geometry



Length : $L=0.240\,m$
Radius : $R=0.006\,m$

1.2 Material properties

$E=2.1\times10^{11}\,N/m^2$
$\nu=0.3$

1.3 Boundary conditions and loadings

- clamped AB Edge
- Charges varying linearly according to z on the generator BC, being worth:

$$q=0 \text{ in } C \text{ and } q=-3000\,N/m \quad B$$

1.4 Initial conditions

Without object for the static analysis.

2 Reference solution

2.1 Method of calculating used for the reference solution

the reference solution is obtained analytically [bib1].

2.2 Results of reference

1) Radial displacement of point: $C \quad u_{rc} = -1.552 \times 10^{-3} m$
2) Stresses of fixed support to point: $B \quad \sigma_{zz}(B) = 169.8 \times 10^{6} Pa$

2.3 Uncertainty on the analytical

solution Solution.

2.4 Bibliographical reference

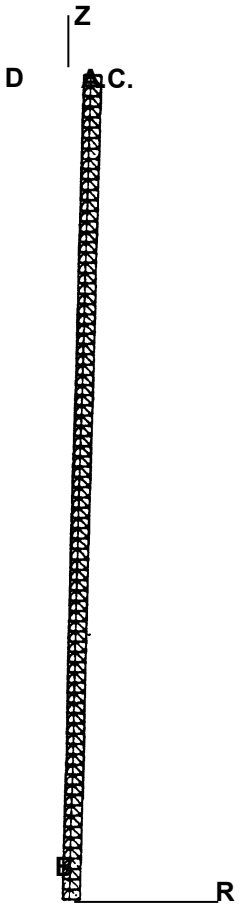
1) S. TIMOSHENKO: Strength of materials, 1st part. Polytechnic library CH. Béranger, Paris, 1947

3 Modelization A

3.1 Characteristic of modelization

AXIS_FOURIER, nets T6

Découpage: 80 elements according to the length
2 elements in thickness



3.2 Characteristic of the mesh

Many nodes: 805
Number of meshes and types: 320 TRIA6

3.3 Values tested

Values provided for $\theta = 0$.

Standard	localization of value	Reference	*Aster*	% difference
Computation 1 (2 modes)				
Not C	$u_r(m)$	-1.552×10^{-3}	-1.54839×10^{-3}	– 0.232

Point B	$\sigma_{zz}(Pa)$	169.8×10^{6}	168.73×10^{6}	– 0.63
Computation 2 (10 modes)				
Not C	$u_r(m)$	-1.552×10^{-3}	-1.54839×10^{-3}	– 0.232
Point B	$\sigma_{zz}(Pa)$	169.8×10^{6}	168.59×10^{6}	– 0.71

3.4 Remark

the values of the deflection of the beam and the stress of fixed support are obtained with accuracy with the first two modes only.

4 Summary of the results

the results resulting from computation are in concord with the analytical solution.