Question 4 Versió 1 (la més recent)

Pregunta 1

Correcte

Puntuació 10,00 sobre 10,00

Consider a clamped at ground pillar shaped as a truncated straight pyramid, height, $15000\ \text{mm}$, dimensions $1500\ \times 500\ \text{mm}$ at its basis, and $500 \times 500\ \text{mm}$ at its top face. The Young modulus of the material and its specific weight are $28.0\ \text{GPa}$, and $25.0\ \times 10^{-9}\ \text{kN/mm}^3$ respectively. Further ---due to the charge it supports---the pillar is under a contraction stress of $33.00\ \times 10^{-6}\ \text{GPa}$, acting on its upper face.

Take a mesh of 55 linear elements with equispaced nodes, numbered upwards and in ascending order; apply the FEA to find the nodes' displacements and answer the questions that follow below.

Hint 1: *In this case*, the area of the transverse section, $A(x)$, varies linearly with the height x; more precisely, it is an affine function of the form $A(x) = \alpha x + \beta$, $0 \leq x \leq 15000$, for the appropriate values of α and β.

Hint 2: It is advisable to use the same units as those that appear in the statement; in this way, the displacements will be obtained directly in mm.

(a) (4 points) The average of the nodes' displacement, defined as the sum of all the nodes' displacement divided by the number of nodes (in mm), is

- -5.3804e-02
- -5.1080e-02 ✔
- -5.1662e-02
- Leave it empty (no penalty)
- -4.7562e-02

Puntuació 4,00 sobre 4,00

La resposta correcta és: -5.1080e-02

Hint 3: The displacement of the node placed at the column's topmost height is u = -8.2573e-02 mm.

(b) (3 points) Using linear interpolation to approximate; the displacement (in mm) at the midpoint of the pillar is

- -5.4772e-02
- Leave it empty (no penalty)
- -6.0011e-02
- -5.6178e-02 ✔
- -5.6411e-02

Puntuació 3,00 sobre 3,00

La resposta correcta és: -5.6178e-02

Hint 4: For the linear interpolation, use the values of the displacement gleaned by the FEM at the (two) nodes of the element the point is in.

(c) (3 points) What should be the specific weight of the material for the displacement's linear interpolation at the midpoint (see **Hint 4**, at the end of the previous question) equals the 50% of the topmost node's displacement? (units in kN/mm^3)

- 1.9660e-09 ✔
- 1.8491e-09
- 2.0850e-09
- 1.6036e-09
- Leave it empty (no penalty)

Puntuació 3,00 sobre 3,00

La resposta correcta és: 1.9660e-09

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