

Exam Structure Mechanics2

Bachelor Civil Engineering 1st year

Module code/name: 202000060-2B M4 B-CE Designing Construction

Course code/name: 202000061 Structure Mechanics 2

Date: 3 July 2024

Time: 13.45-15.45 (+25% for students who may use extra time)

Instructors: Vanessa Magnanimo

Type of test: Exercises

INSTRUCTIONS & PRACTICALITIES

- All Rules of Order for Testing as established by the examination board apply to this test. In case of inconsistencies with other rules set by the examiner, the Rules of Order for Testing prevail.
- Please read each question carefully before answering the question.
- All paperwork must be handed in at the end of the test, including scrap paper.
- For answering questions, use the working sheets handed to you. If one sheet is not enough, use the sheet with the text "Continuation of ..." in the top right corner.
- The elaboration of the question must be clear. Show what you do, so use a lot of drawings, sketches, or schemas. Make sure to write/draw your answers in a readable form.

ALLOWED RESOURCES

Allowed material to be used during the exam:

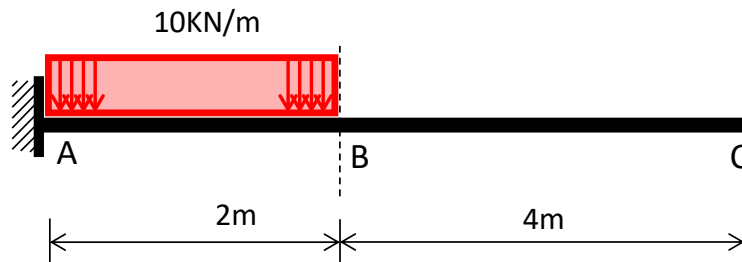
- Scientific calculator (not a communication device)
- Formula sheet
- English-Dutch dictionary
- Pen or/and pencil, coloured pens
- Ruler

Attachments: Formula sheet, Forget-me-Not

Exercise 1 (30 pt)

The cantilever beam in the figure is supported by a fixed support in A. A distributed load is applied from A to B. Dimensions are reported in the figure. EI is constant.

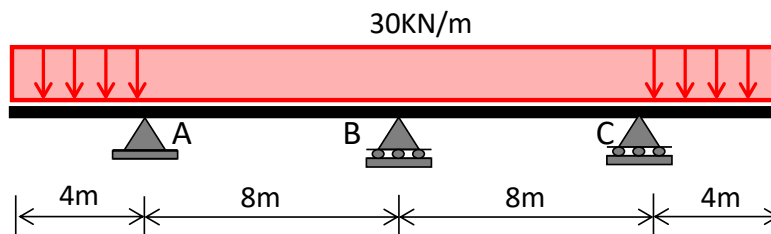
- Derive the equation of shear force, bending moment, rotation, vertical displacement. In your calculation state explicitly the boundary conditions to apply.
- Sketch the diagrams of shear force, bending moment and displacement.
- Calculate the rotation the vertical displacement in B and C, in terms of EI .



Exercise 2 (35 pt)

Consider the statically indetermined beam in the figure. Assume A is pinned, and B and C are rollers. EI is constant.

- Determine the internal moments at the supports A, B, and C, using Cross method.
- Sketch the diagram of bending moment and shear force.
- Find the shear force in A.



Exercise 3 (35 pt)

A cantiliver concrete beam ($b \times h = 300 \times 650 \text{ mm}^2$) should be able to bear a load of 25 kN/m. Assume concrete C30/37, steel B500 and $a = 50 \text{ mm}$ ($a = h - d$)

- Determine the required bending reinforcement
- Indicate which steel bars you will choose, and how to place them in the cross section, considering also the spacing requirements.

