

Exam Structure Mechanics2

Bachelor Civil Engineering 1st year

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

Course code/name: 202400790 Structure Mechanics 2 (Part1 - Structural Mechanics)

Date: 1 July 2025

Time: 8.45-10.45 or 10.45-12.45 (+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:

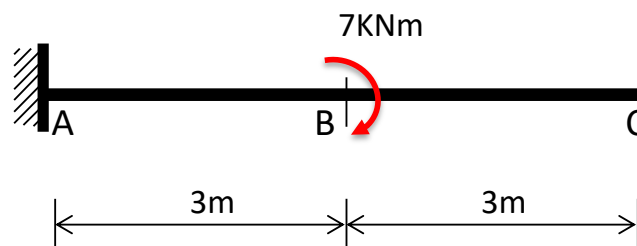
- Scientific calculator (not a communication device)
- Formula sheet
- English-Dutch dictionary
- Pen or/and pencil, coloured pens
- Ruler

Attachments: Formula sheet, Forget-me-Not

Exercise 1 (25 pt)

The beam AC is supported by fixed support in A. An external moment is applied in B. Dimensions are reported in the figure. EI is constant.

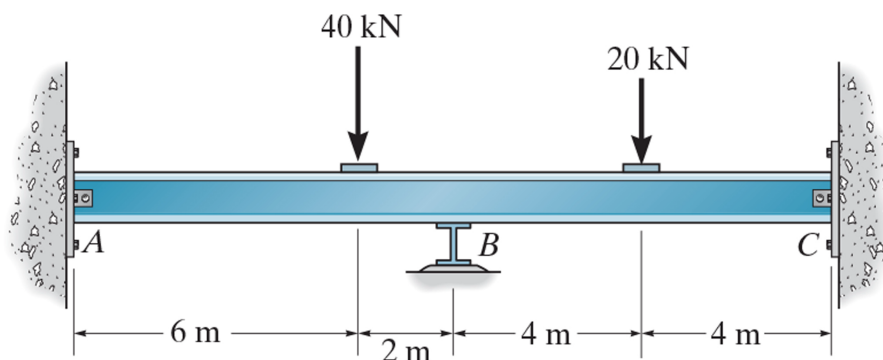
- Derive the equation of shear force, bending moment, rotation, vertical displacement. In your calculation state explicitly the boundary conditions applied.
- Plot the diagrams of shear force, bending moment and displacement.
- Calculate the rotation and the vertical displacement in C, in terms of EI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



Exercise 2 (35 pt)

The statically indeterminate beam in the figure is supported by fixed supports in A and C and by a roller in B. E and I are constant.

- Determine the moments in A, B and C, using the method of cross.
- Sketch the diagrams of bending moment and shear force.
- Determine the shear force in A and on the left of B.



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Exercise 3 (40 pt)

The beam is subjected to the 15KN punctual load. The cross section of the beam is rectangular with dimensions $b \times h = 600\text{mm} \times 300\text{mm}$.

- a) Identify the most critical point(s) of the beam and explain why they are.
- b) Sketch the distribution of normal and tangential stress in such critical cross sections.
- c) Consider the critical cross sections found above. Then:
 - Determine the principal stresses and principal stress directions in the middle of the cross-sections; draw the Mohr's circles.
 - Determine the principal stresses and principal stress directions at the top of the cross-sections; draw the Mohr's circles.
 - Compare the results and comment on your findings.

