

Student number: _____
Student name: _____

UNIVERSITY OF TWENTE.

Exam Structural Mechanics 2

Bachelor Civil Engineering 1st year

Module code/name: 202000060-2B M4 B-CE Designing Construction
Course code/name: 202400790 Structural Mechanics 2 (Part 2 - Structural Design)
Date: 01 July 2025
Time: 8.45-10.45 or 10.45-12.45 (+25% for students who may use extra time)
Instructors: Floriana Anselmucci

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

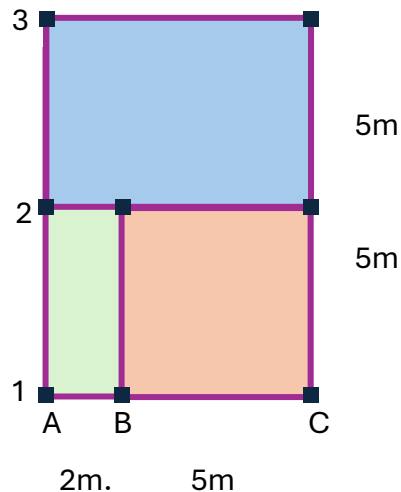
Allowed material to be used during the exam:

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

Attachments: Formula sheet, Materials tables, ForgetMe-Not

Exercise 1 (30 points)

The concrete slab illustrated in the figure below has an overall thickness of 250 mm and is designed to support a variable load of 5 kN/m². Consider only the slab selfweight, obtained using a unit weight of reinforced concrete is 25 kN/m³. Assume the column height is 3.5 m, with the self-weight of both columns and beams being 0.5 kN/m. Based on this information, calculate the design loads acting on beams (indicated in purple) A1-B1, A3-C3, B2-C2, and column (indicated in black) B2.



Exercise 2 (40 points)

A simply supported reinforced concrete beam has a span length of 8.5m, and it is designed with concrete class C25/30 and reinforcement steel B500. The beam is part of an underground parking garage, and it is subjected to uniformly distributed permanent loads of 15 kN/m and variable loads of 18 kN/m. Ignore the beam self-weight. The cross section has a width b of 350 mm, a height of 450mm, and a cover thickness of 25mm. Design the bending reinforcement according with Eurocode 2. Sketch as well the cross section, and the position of the reinforcements.

Exercise 3 (25 points)

Design a simply supported timber beam with a rectangular cross-section for a roof with a plastered ceiling. The beam is made of C24 solid timber in Service Class 3, with a span of 8.0 m, a permanent load of 2.0 kN/m, and a variable long-term load of 1.2 kN/m. The beam dimensions are: width $b = 50$ mm, height $h = 200$ mm. Consider for a C24 timber a $E_{0,mean} = 11\text{kN/mm}^2$. Check the beam for bending according to Eurocode 5.