



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of BUILDING & Civil engineering

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 4412: STRUCTURAL DESIGN II

END OF SEMESTER EXAMINATION

SERIES: JANUARY 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** questions.

Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (30 Marks)

Figure Q1 shows the plan of a residential building. Design and detail the slab in the panel A3- A4 to D3-D4, assuming the following data:

Slab thickness = 100mm

Live load = 2.4 kN/m²

Floor finishes = 0.6kN/m²

Grade 20 concrete

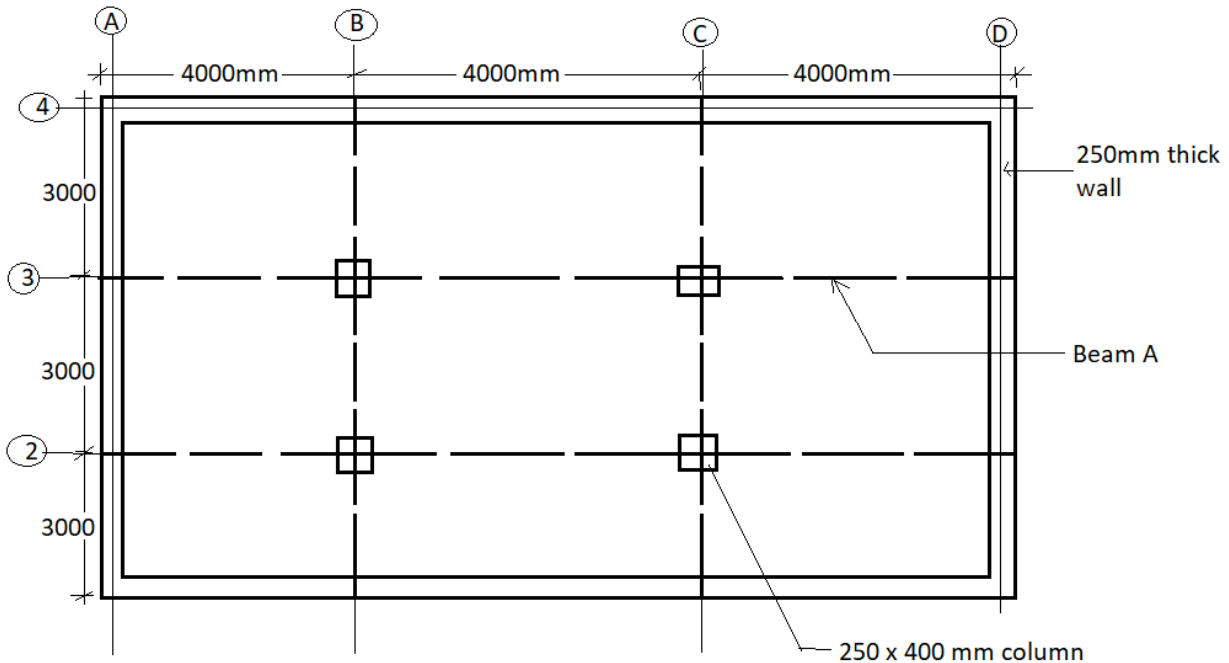


Figure Q1

QUESTION TWO (20 Marks)

- (i) Design the longitudinal steel and links for a 300 mm square reinforced concrete column, short-braced which is to carry an ultimate load of 1400 kN, with the following material properties; $f_{cu} = 25 \text{ N/mm}^2$ and $f_y = 460 \text{ N/mm}^2$. (14 Marks)
- (ii) Clearly describe two ways that may be used to achieve pre-stressing in concrete construction. (6 Marks)

QUESTION THREE (20 Marks)

A solid footing has to transfer a dead load of 1000 kN and an imposed load of 400 kN from a square column 400 x 400 mm (with 16 mm bars). Assuming $f_y = 460$, and $f_{ck} = 20 \text{ N/mm}^2$, and safe bearing capacity to be 200 kN/m^2 , design the footing. (20 Marks)

QUESTION FOUR (20 Marks)

Figure Q4 shows a simply supported reinforced concrete beam carrying a uniformly distributed load of 80 kN/m. Design the beam, assuming that the beam has a width of 250 mm and a depth of 800 mm. The concrete grade is 25 with $f_y = 460 \text{ N/mm}^2$ and $f_{yv} = 250 \text{ N/mm}^2$.

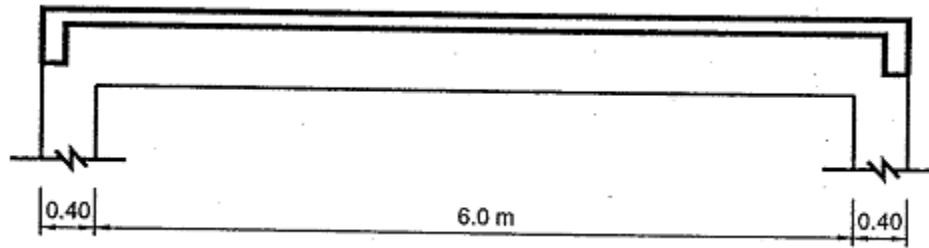


Figure Q4

QUESTION FIVE (20 Marks)

Design the longitudinal and lateral reinforcement in a rectangular reinforced concrete column of size 300 mm by 400 mm subjected to a design ultimate load of 1200 kN and an ultimate moment of 200 kNm with respect to the major axis. Adopt C20 concrete and $f_y = 415 \text{ N/mm}^2$.