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MAIN EXAM 2021/2022

CSE 511



**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS  
2021/2022 ACADEMIC YEAR**

**FIFTH YEAR SEMESTER ONE MAIN EXAMINATIONS**

**FOR THE DEGREE  
OF  
BACHELOR OF SCIENCE IN CIVIL AND STRUCTURAL  
ENGINEERING**

**COURSE CODE: CSE 511**

**COURSE TITLE: DESIGN OF BUILDINGS**

**DATE: TUESDAY 19<sup>TH</sup> APRIL 2022**

**TIME: 12.00 – 2.00 PM**

**INSTRUCTIONS:**

1. This paper contains FOUR questions.

2. Question ONE is compulsory.

3. ATTEMPT ANY other TWO questions from SECTION B in this booklet.

4. The use of BS 8110 as well as Eurocode is permitted.

5. where information is deemed to be missing state and make reasonable assumptions with reasons

Examination duration is **2 Hour**

MMUST observes ZERO tolerance to examination cheating.

This Paper Consists of 5 Printed Pages. Please Turn Over.

**SECTION A (COMPULSORY)**

**Question one (30 marks) {COMPULSORY}**

A simply supported beam 7.5m long 700x250mm carries an ultimate load of 45kN/m. The beam is connected to the column supporting the beam as a portal frame. The following are the bending moment and shear force diagrams

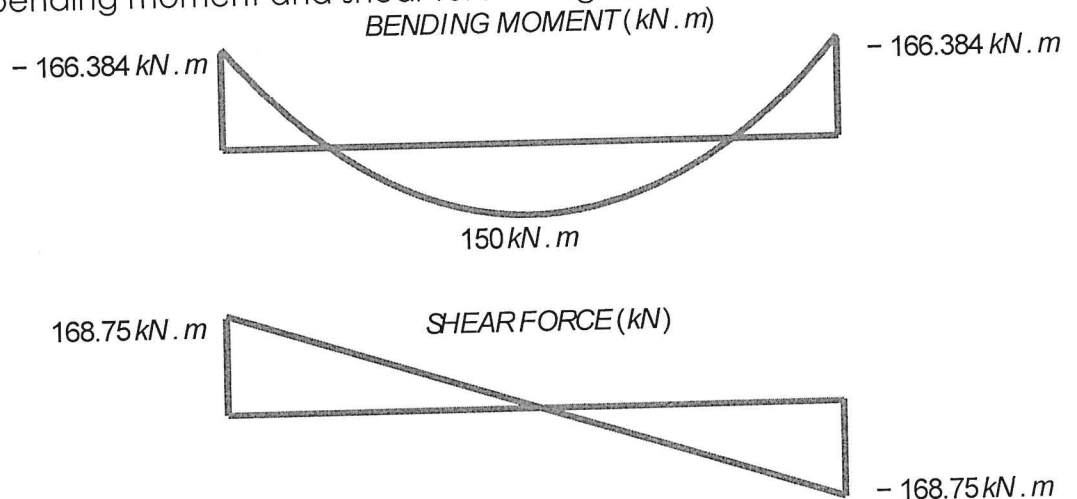


Fig. Q1

Given  $f_{cu}=40\text{N/mm}^2$ , and  $f_y=460\text{N/mm}^2$ , and a cover of 25mm calculate:

- I. Design the required main steel for the beam (10 marks)
- II. Check for shear and calculate the link spacing (8marks)
- III. Sketch the beam reinforcement (7 marks)
- IV. Prepare a bar bending schedule for the beam (5 marks)

**SECTION B (ATTEMPT ANY TWO QUESTIONS)**

**Question two (20 marks)**

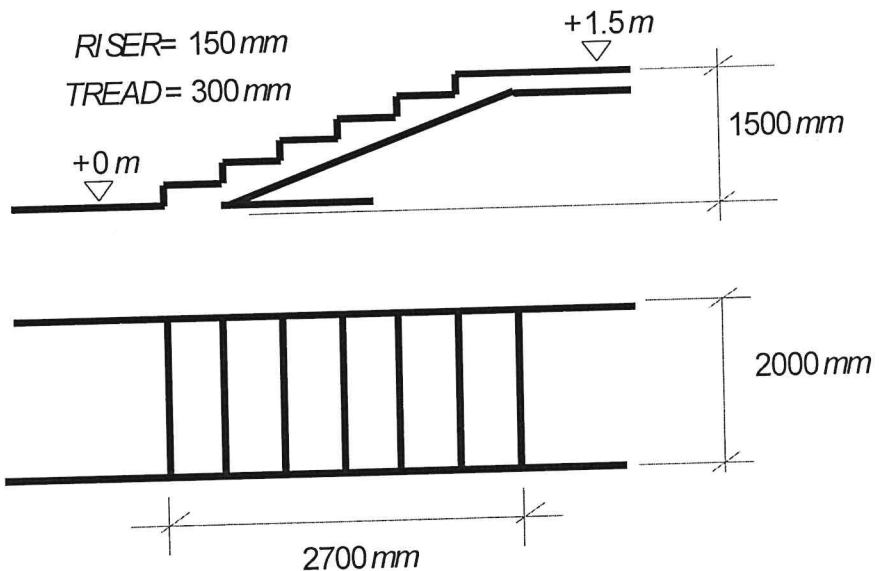


Fig. Q2

For the single flight staircase (waist=175mm) in Fig.Q2, Given extra deadload due to finishes = 0.5kN/m<sup>2</sup> and a live load of 4.0 kN/m<sup>2</sup>, characteristic strengths of concrete  $f_{ck}=30\text{ N/mm}^2$ , steel  $f_{yk}=500\text{ N/mm}^2$ . Cover =20mm

- Calculate the reinforcement requirement for the staircase (9 marks)
- Check for deflection of the staircase (2 marks)
- Sketch the reinforcement for the staircase (5 marks)
- Prepare a bar bending schedule for the staircase reinforcement (4marks)

**Question three (20 marks)**

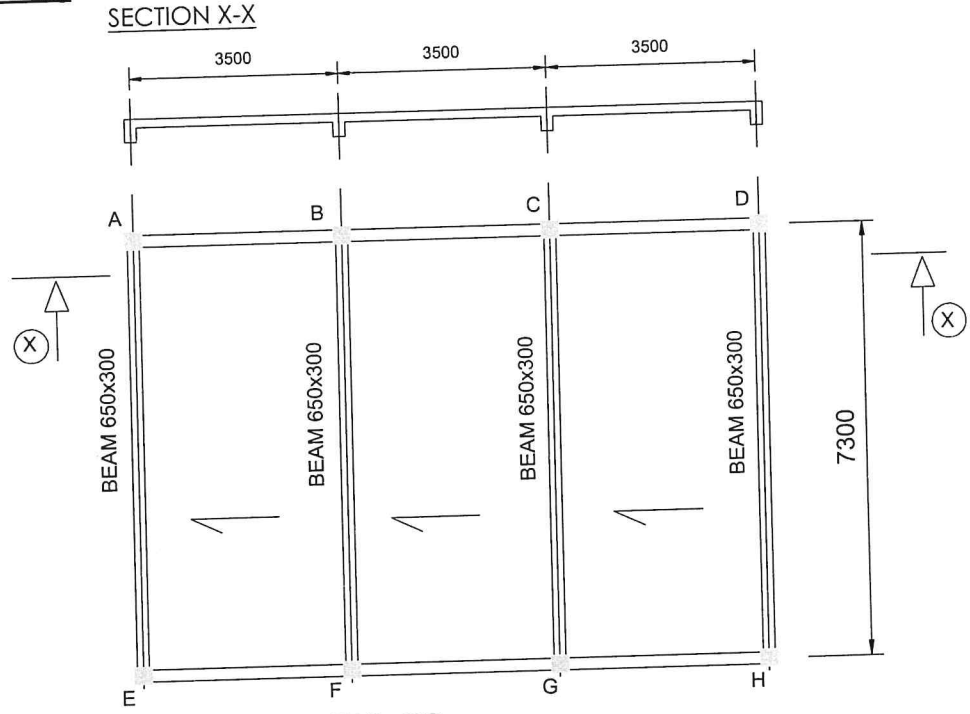
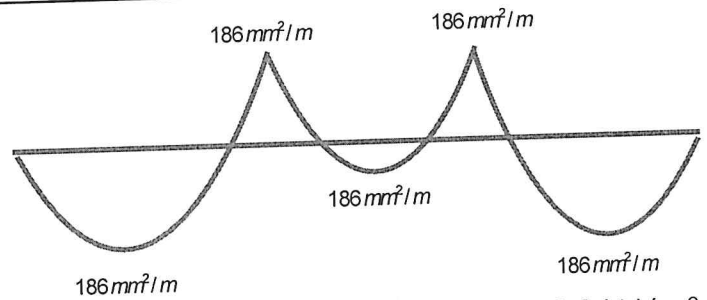


FIG. Q3.a

The loading on the one-way slab bay produces moments as follows, End spans 11.7 kN.m, Interior span=3.66 kN.m and first interior support -14.63kN.m.

**REQUIRED AREA OF STEEL**

FIG.Q3.b

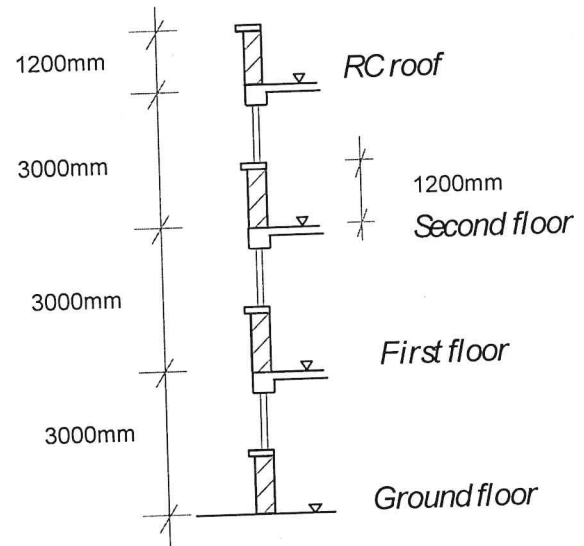


Using Fig.Q3 and given the slab is 150mm thick, and the imposed load is 3.0 kN/m<sup>2</sup>, cover =20mm,  $f_{ck}=30N/mm^2$ . Do the following. *Hint ensure to check  $A_{s,min}$*

- Sketch the steel reinforcement for the panel showing clearly the B1, T1, B2 and T2 bars (12 Marks)
- Prepared a bar bending schedule (8 marks)

**Question four (20 marks)**

Fig. Q4



Consider a 400x400mm column on grid line B (Fig Q3.a). Determine the following if the cross-section of the building is as Fig.Q4. All floor slabs are 150mm thick RC including the RC roof. Take the 1200mm high external wall to be natural stone of density 19kN/m<sup>3</sup>. Soil bearing pressure =300kN/m<sup>2</sup>. The live load = 3.0 kN/m<sup>2</sup>. Take  $f_{yk}=500\text{N/mm}^2$ ,  $f_{ck}=30\text{ N/mm}^2$ , cover=20mm. Take the secondary beams to be 400x200mm. Assume a dead load of 160kN for the foundation, starter column and soil.

- Calculate the loading per floor in kN for both live load and dead load. Show the foundation loads both dead and live loads **(8 marks)**
- Design the foundation reinforcement for the foundation B. No need to shear checks **(8 marks)**
- Sketch the foundation reinforcement **(2 marks)**
- Prepare a bar bending schedule for the reinforcement **(2 marks)**

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**END**  
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