



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

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

FIFTH YEAR SPECIAL/ SUPPLEMENTARY EXAMINATIONS

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

COURSE CODE: CSE 511

COURSE TITLE: DESIGN OF BUILDINGS

DATE: 3RD OCTOBER 2022

TIME: 2 HOURS

INSTRUCTIONS:

1. This paper contains FOUR questions
2. ATTEMPT ALL questions in Section A and ONE question from Section B in this booklet
3. Marks for each question are indicated in the parenthesis.

Examination duration is **2 Hour**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 6 Printed Pages. Please Turn Over.

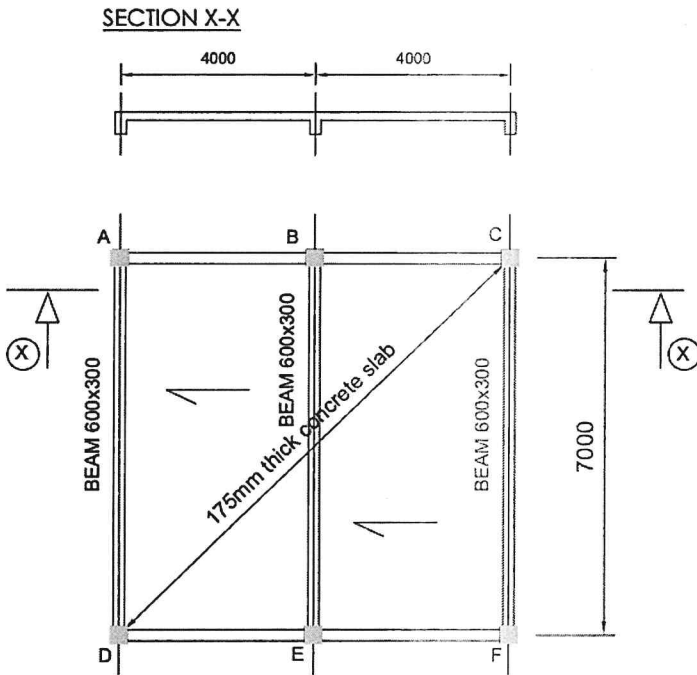


Figure 1: SLAB BEAM LAYOUT

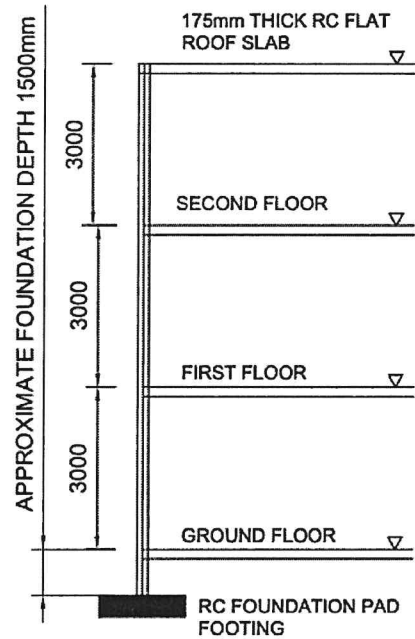


FIGURE 2: COLUMN (AT GRID E) AND PAD FOUNDATION

Table 1: Design Data

Note:	Use $f_{yk}=500\text{N/mm}^2$, $f_{ck}=25\text{ N/mm}^2$, Cover to slab=20mm, Cover to beams=25mm, Cover to foundations=40mm, unit weight of concrete =24 kN/m^3 ,
Loads:	Imposed load on the floors = 3.0 kN/m^2 Imposed load on the RC roof slab = 1.5 kN/m^2 Soil bearing pressure = 175 kN/m^2

SECTION A: COMPULSORY

Question one (20 marks)

Using Figure 1 calculate the steel reinforcement required in the one way spanning R.C. (Reinforced Concrete) Suspended solid floor slab and check for deflection only.

(15MKS)

Sketch the reinforcement in the slab.

(5MKS)

Hint: Use the bending moment , shear force coefficients for Moment and Shear forces.

Question Two (20 marks)

Using Figure 1 calculate the steel reinforcement required in the 700x200 beam along grid B-E.

- Sketch the reinforcement in the Beam, including the main reinforcement and the shear reinforcement (12 mks).
- Check deflection and shear (8 marks)

SECTION B: ANSWER ONE QUESTION

Question Three (20 marks)

Using Figure 1 and FIGURE 2

- Derive the loads acting on a 350x350mm RC Column for the Ground to First floor level (7MKS)
- Calculate the reinforcement requirement for the column (Ground level to first floor level) at the point on the grid E. (10MKS)
- Sketch a cross section of the column (3MKS)

Question Four (20 marks)

Using FIGURE 2

- Size the R.C. (reinforced concrete) pad foundation footing (5MKS)
- Calculate the reinforcement requirement for the RC pad foundation (10MKS)
- Sketch the reinforcement for the foundation. (5MKS)

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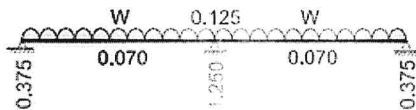
Continuous Beam Bending Tables

Notes:

- All spans have equal length = L
- Moment of inertia is constant
- **W** is a load on one span (in kN) therefore $W = \text{UDL} \times L$ or $W = PL$
- Point Loads are applied either in 1/2 or 1/3 and 2/3 of a span L

Reaction = coefficient x W

Moment = coefficient x W x L



Cross sectional area of number of bars (mm²) - FOR BEAMS

Bar Size (mm)	Number of Bars											
	1	2	3	4	5	6	7	8	9	10	11	12
6	28	57	85	113	141	170	198	226	254	283	311	339
8	50	101	151	201	251	302	352	402	452	503	553	603
10	79	157	236	314	393	471	550	628	707	785	864	942
12	113	226	339	452	565	679	792	905	1018	1131	1244	1357
16	201	402	603	804	1005	1206	1407	1608	1810	2011	2212	2413
20	314	628	942	1257	1571	1885	2199	2513	2827	3142	3456	3770
25	491	982	1473	1963	2454	2945	3436	3927	4418	4909	5400	5890

Cross sectional area of bars per metre (mm²/m) - FOR SLABS

Bar Size (mm)	Bar Spacing (mm)											
	50	75	100	125	150	175	200	225	250	275	300	400
6	565	377	283	226	188	162	141	126	113	103	94	71
8	1005	670	503	402	335	287	251	223	201	183	168	126
10	1571	1047	785	628	524	449	393	349	314	286	262	196
12	2262	1508	1131	905	754	646	565	503	452	411	377	283
16	4021	2681	2011	1608	1340	1149	1005	894	804	731	670	503

Link reinforcement in beams, $\frac{A_{sv}}{s_v}$ (mm²/mm) - TWO (2) legs - FOR SHEAR IN BEAMS

Bar Size (mm)	Spacing of Links (mm)											
	50	75	100	125	150	175	200	225	250	275	300	400
6	1.13	0.75	0.57	0.45	0.38	0.32	0.28	0.25	0.23	0.21	0.19	0.14
8	2.01	1.34	1.01	0.80	0.67	0.57	0.50	0.45	0.40	0.37	0.34	0.25
10	3.14	2.09	1.57	1.26	1.05	0.90	0.79	0.70	0.63	0.57	0.52	0.39