



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

MAIN CAMPUS

**UNIVERSITY MAIN EXAMINATIONS
2021/2022 ACADEMIC YEAR**

FOURTH YEAR SECOND SEMESTER SUPPLEMENTARY EXAMINATIONS

**FOR THE DEGREE
OF
BACHELOR OF TECHNOLOGY IN BUILDING CONSTRUCTION**

COURSE CODE: BTB 412

COURSE TITLE: STRUCTURAL DESIGN III

DATE: 6TH OCTOBER

TIME: 9- 11 A.M

INSTRUCTIONS:

1. Programmable calculators and not allowed in this exam
2. This paper contains **FOUR** questions
3. Attempt **QUESTION ONE** and any other **TWO** questions in SECTION B
4. BS (British Standards) Design Codes are permitted for this exam
5. Where information is deemed to be missing, make and state reasonable assumptions.

MMUST observes ZERO tolerance to examination cheating

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

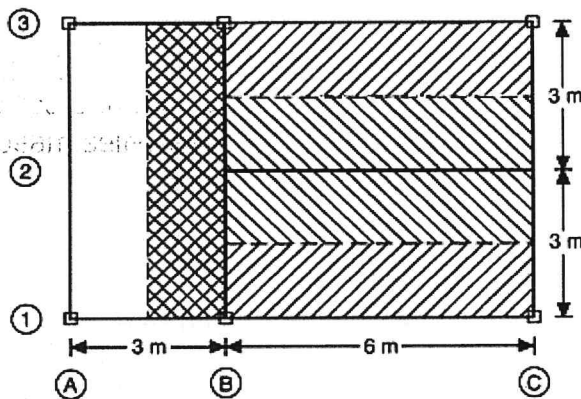
SECTION A- answers all question in this section.**Question one (40 marks) COMPULSORY**

- a) Several reinforced concrete buildings in Kenya have collapsed in the recent past. What are the main causes of building failure and how can they be mitigated. (10 marks)
- b) State and explain the significance of site investigations in building construction(10 marks)
- c) What are the pros and cons of using steel instead of concrete in construction of the upcoming structure? (10 marks)
- d) Discuss poor construction methods that result in structural failures in buildings. (10 mks)

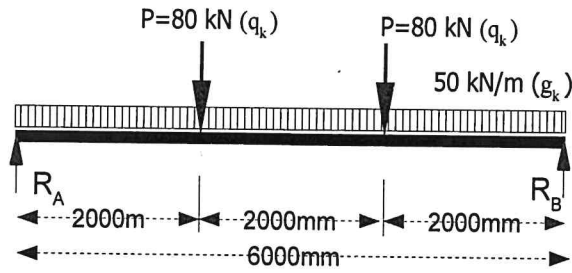
SECTION B**Question Two****(20 marks)**

The floor shown below with an overall depth of 225 mm is to be designed to carry an imposed load of 3kN m^{-2} plus floor finishes and ceiling loads of 1kN m^{-2} . Assuming that all columns are 3m and that the beam and column weights are 70 and 60Kg m^{-1} run respectively, calculate the design loads acting on;

- a) beams B1-C1, B2-C2, B1-B3
b) Columns B1 and C1

**Question Three****(20 marks)**

A simply supported beam of 6000mm span is carrying a uniformly distributed dead load of 50kN/m (including the beam self-weight) and two point live loads of 80kN at $1/3$ and $2/3$ of the span.



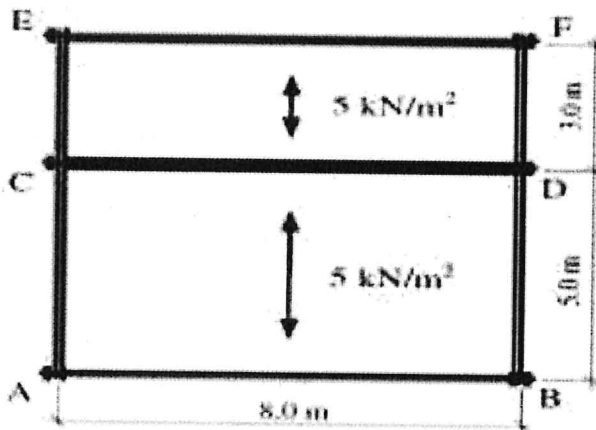
Shear force table

Distance (m)	0	2	2	4	4	6
Shear force (kN)	-338	-198	-70	70	198	338

- a.) Draw the Shear force diagram using the information given (2 marks)
- b.) Calculate the stirrup reinforcement size and spacing (10 marks)
- c.) Draw a sketch of the beam showing only the stirrup reinforcement spacing (4 marks)
- d.) Prepare bar bending schedule only for the links (4 marks)

Question Four (20 marks)

Examine the floor plan below and determine the total loads on all beams (10mks)



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MEMORY AID

Cross sectional area of number of bars (mm ²)												
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 in pairs per metre (mm ² /m)												
Bar Size (mm)	Bar Spacing (mm)											
	50	75	100	125	150	175	200	225	250	275	300	400
6	1131	754	565	452	377	323	283	251	226	206	188	141
8	2011	1340	1005	804	670	574	503	447	402	366	335	251
10	3142	2094	1571	1257	1047	898	785	698	628	571	524	393
12	4524	3016	2262	1810	1508	1293	1131	1005	905	823	754	565