(*University of Choice*)

# MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

**MAIN CAMPUS**

## UNIVERSITY EXAMINATIONS 2018/2019 ACADEMIC YEAR

## THIRD YEAR FIRST SEMESTER EXAMINATIONS

## FOR THE DIPLOMA

## IN

## CIVIL ENGINEERING

**COURSE CODE:** REINFORCED CONCRETE AND MASONRY DESIGN

**COURSE TITLE:** DCE 087

**DATE: THURSDAY 31ST JANUARY 2019 TIME: 9.00AM – 11.00AM**

**INSTRUCTIONS:**

1. This paper contains **FIVE** questions
2. Question **ONE** is **COMPULSORY**
3. Attempt any other **THREE** questions
4. Marks for each question are indicated in the parenthesis.
5. Examination duration is **2 Hour**

MMUST observes ZERO tolerance to examination cheating

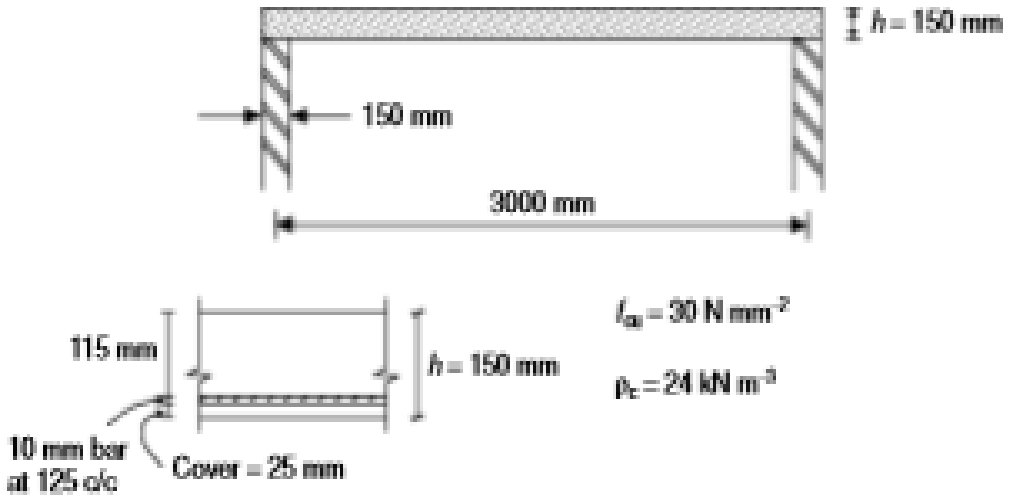
## Question One - Compulsory (25 Marks)

a) State and explain the **two** principal categories of limit states normally considered in design

b) Describe the measures proposed in BS 8110 to achieve durable concrete structures.

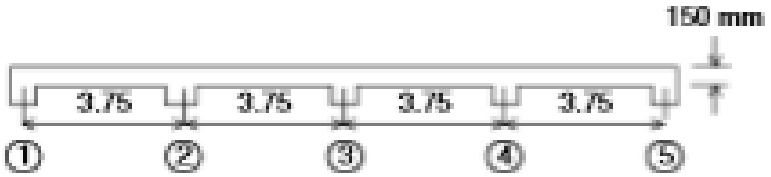
c) Explain the difference between M and Mu.

d) A concrete floor reinforced with 10 mm diameter mild steel bars (fy = 250 N/mm$^2$) at 125 mm centres (As = 628 mm$^2$ per metre width of slab) between brick walls as shown below. Calculate the maximum uniformly distributed imposed load the floor can carry.




## Question Two (15 Marks)

Design the continuous one-way spanning slab shown below assuming the cover to the reinforcement is 25 mm



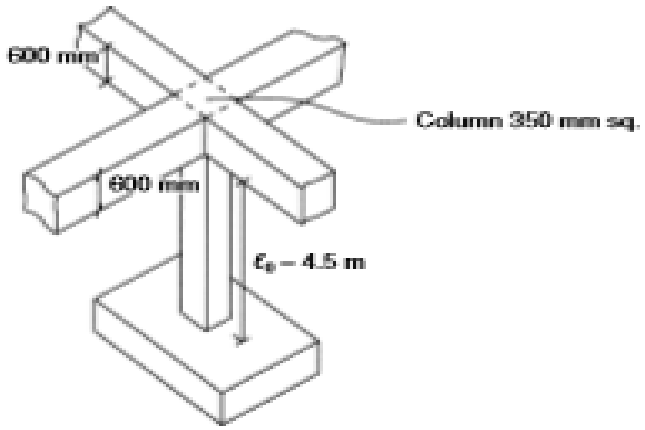
## Question Three (15 Marks)

Design the longitudinal and shear reinforcement for a 275 mm square, short-braced column, which supports either:

a) An ultimate axial load of 1280 kN and a moment of 62.5 kNm about the x–x axis or

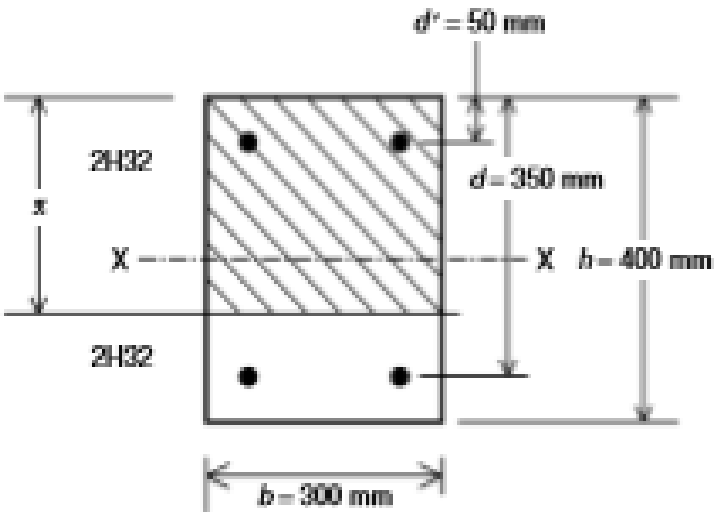
b) An ultimate axial load of 1280 kN and bending moments of 35 kNm about the x–x axis and 25 kNm about the y–y axis.

Assume fcu = 30 $Nmm^{-2}$, fy = 500 $Nmm^{-2}$ and cover to all reinforcement is 35 mm.




## Question Four (15 Marks)

Determine whether the column section shown below is capable of supporting an axial load of 200 kN and a moment about the x–x axis of 200 kNm by calculating the load and moment capacity of the section when the depth of neutral axis of the section, x = ∞, 200 mm and 350 mm. Assume fcu = 35 $Nmm^{-2}$ and fy = 500 $Nmm^{-2}$.




**Question Five (15 Marks)**

a) Explain the difference between columns, which are short and slender, and those, which are braced and unbraced. (4 Marks)

b) Calculate the ultimate axial load capacity of a short-braced column supporting an approximately symmetrical arrangement of beams assuming that it is 500 mm square and is reinforced with eight 20 mm diameter bars. Assume that fcu = 40 N/mm2, fy = 500 N/mm2 and the concrete cover is 25 mm. Design the shear reinforcement for the column. (11 Marks)