(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS 2019/2020 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATIONS

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

COURSE CODE: CSE 313

COURSE TITLE: STRUCTURAL MASONRY DESIGN

DATE: THURSDAY 16TH JANUARY 2020 TIME: 3.00 – 5.00 PM

INSTRUCTIONS:

1. This paper contains FOUR questions
2. QUESTION ONE IS COMPULSORY
3. Attempt any other TWO questions
4. BS 5628-1 is allowed
5. 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 4 Printed Pages. Please Turn Over.

Question ONE (30 marks)

(a) Identify six factors which influence the compressive strength of masonry **[6 Marks]**

(b) Explain the purpose of mortar in masonry construction. **[5 Marks]**

(c) Explain the concept of limit state design. **[6 Marks]**

(d) A cavity wall of length 6 m supports the loads shown in **Figure Q1**. The inner load-bearing leaf is built using concrete blocks of length 440 mm, height 215 mm, thickness 100 mm and faced with plaster, and the outer leaf from standard format clay bricks. Design the wall assuming the masonry units are category I and the construction control category is normal. The self-weight of the blocks and plaster can be taken to be 2.4 kN m^{-2}

[14 Marks]

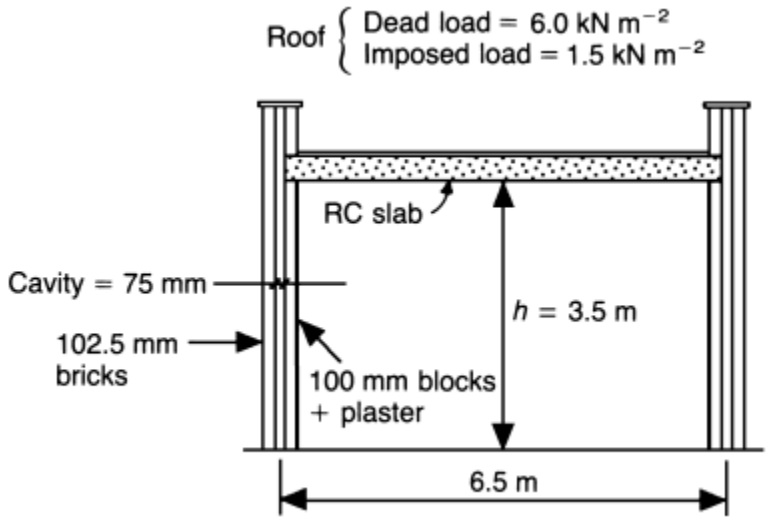

Figure Q1

Question TWO (20 marks)

a) Explain the difference between the terms: engineering brick, common brick, facing brick and special brick. **[4 Marks]**

b) Identify the factors which influence the bending moment coefficient 'α' for laterally loaded panels. **[3 Marks]**

c) The internal load-bearing brick wall shown in **Figure Q2** supports an ultimate axial load of 140 kN per metre run including self-weight of the wall. The wall is 102.5 mm thick and 4 m long. Assuming the masonry units conform to Category II and the construction control category is 'normal', design the wall.

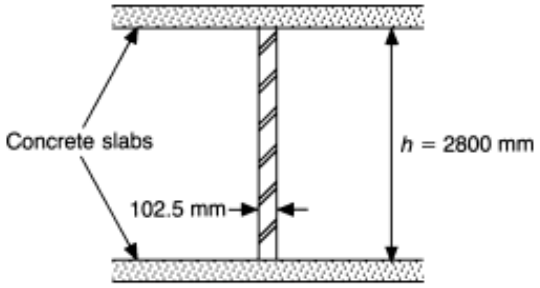

Figure 2 **[13 Marks]**

Question THREE

The side cladding for a steel portal framed building is to be of cavity wall construction as shown in **Figure Q3.** At the base the wall is supported on a dropped edge beam which is incorporated in the floor slab and is built off a bituminous damp-proof course. The wall is built up to, but not pinned to, the structure above. Using the design data given and considering a typical internal panel:

(i) Determine a suitable brick/mortar combination assuming both leafs are constructed from calcium silicate bricks, and

(ii) Determine the maximum wind load which can be resisted if the outer leaf is constructed from calcium silicate bricks and the inner leaf is constructed from 90 mm thick hollow concrete blocks with a compressive strength of 7 N/mm^2. Both leaves are constructed using mortar type (i).

Design data:

Characteristic wind load (*W*k) for (i)	0.5 kN/m^2
Category of manufacturing/construction control	special/normal

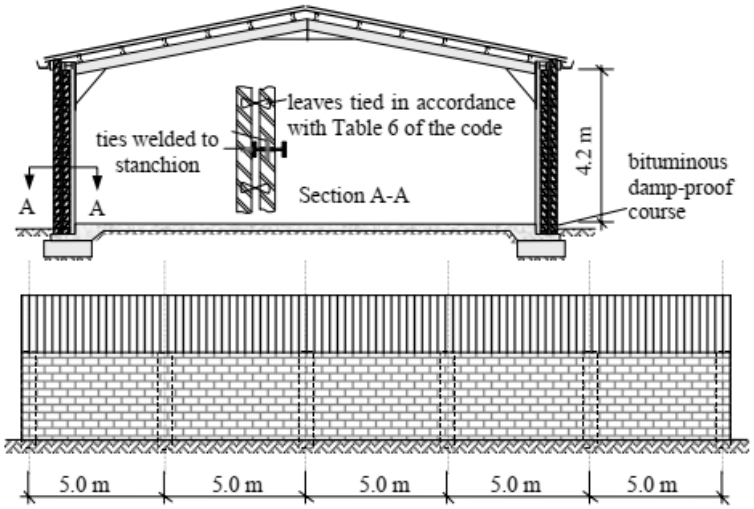

Figure Q3

[20 Marks]

Question FOUR

The cross-section of an eccentrically loaded column is shown in **Figure Q4.** Using the design data given, determine the maximum value of the load P which can be applied in each of the cases (i) to (iv) indicated in **Table 4**

Design data:

Assume the category of manufacturing control	special
Assume the category of construction control	normal
Characteristic strength of unit (standard format bricks)	35.0 N/mm^2
Mortar designation	Type (ii)
Effective height about the y-y axis ($h_{ef\ yy}$)	2500 mm
Effective height about the x-x axis ($h_{ef\ xx}$)	5000 mm

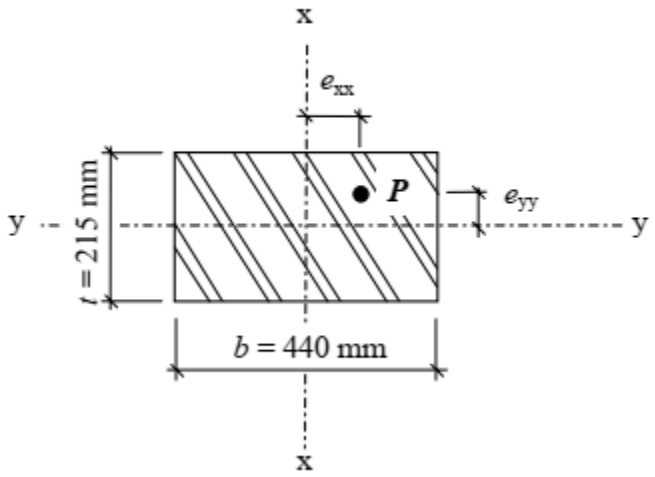

Figure Q4

Table Q4

Case	e_{xx} **(mm)**	e_{yy} **(mm)**
(i)	15.0	8.0
(ii)	20.0	25.0
(iii)	30.0	6.0
(iv)	40.0	20.0

[20 Marks]