



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC IN CIVIL ENGINEERING

ECE 2414 : FOUNDATION ENGINEERING II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 16 May 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, Drawing Instruments, Scientific calculator, examination pass and student ID

This paper consists of five questions.

Attempt question ONE (Compulsory) and any other TWO questions.

QUESTION ONE (COMPULSORY)

- a) Details of a gabion retaining wall are shown on Figure Q1a. A wall constructed as above is known to have failed after construction during a night which had heavy rains. Plate Q1. Discuss the likely course of failure.

(10marks)

- a) Details of a mass concrete retaining wall are shown on Figure Q1b. The unit weight of the masonry is 24kN/m^3 . The density of the retained soil is 18kN/m^3 . The safe bearing capacity is 200kN/m^2 . The angle of friction for the backfill is 38° . The value of δ between the wall and the foundation is 25° .

Determine

The factor of safety against overturning

The factor of safety against sliding

The maximum and minimum pressures below the base

(15marks)

HINT

$$q = \frac{P}{BL} \left(1 \pm \frac{6e}{L} \right)$$

Question Two

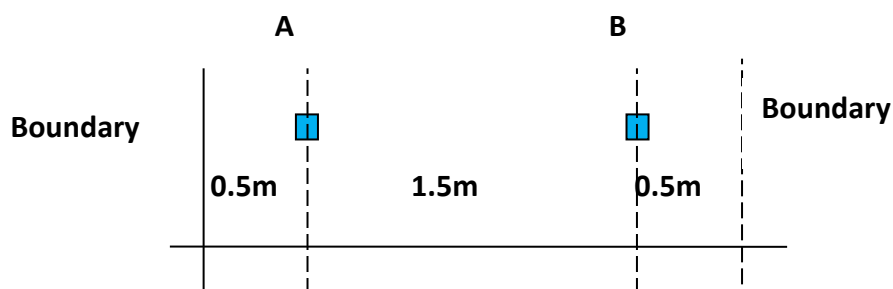
- a) Your client is politically correct and has acquired a plot in a site with deep loose sandy strata. The area is hot and experiences heavy storms. He has engaged you as the foundation engineering consultant.
- Discuss the difficulties that you might experience in designing the foundations of a palatial double storied home..for your client.
 - Propose a suitable system

(8) Marks

- b) The vertical loads on columns A and B shown on Figure Q1 are 1000 and 500kN respectively. The stratum on which the columns are to be founded is dense compact gravel. The estimated allowable bearing capacity of the strata is 200kN/m²

Design

- A suitable combined trapezoidal foundation for the two column loads if the foundation cannot extend beyond the boundaries. **(8) Marks**
- A suitable separate foundation for either column A or B **(4) Marks**



Question Three

You have been assigned the task of designing the foundation of a 30 storied ultramodern office block with three basement levels in Mombasa. Site investigation for the site is summarised on Table Q2.

- a) Discuss the various methods of estimating the allowable bearing capacity of a rock stratum
[5 marks]
- b) Discuss the foundation challenges for this site and make a proposal of a suitable foundation type. In particular:
ii) Critique different types of foundations and then propose one type of foundation
iii) Describe the construction procedure for the proposed foundation.
[10 marks]
- c) With only the information given in Table Q2 design the foundation of a column in the teaching block whose working service load has been estimated at 12,000kN.
[5 marks]

Table Q2 Site investigation summary

Material encountered	Depth range (m)	SPT N values	Unconfined compression strength (kN/m²)
Completely Weathered rock	0-12	20	-
Volcanic Ash	12-19	2	-
Weathered rock	19-22	50	-
Un-weathered Rock	22-30	-	15,000

[20marks]

Question Four

You have been appointed the project engineer for the proposed second Nyali Bridge. The bridge like the existing one is envisaged to be a long stressed type parallel to the existing bridge

Discuss: -

- i. The scope and detail of a site investigation needed to establish the geotechnical parameters for the design of the bridge foundations for the proposed bridge

- ii. The scope and detail of a site investigation needed for the preliminary design of the road pavement structure of the approach roads

[20marks]



a) Section of an 8 meter high wall

b) Wall after collapse

Fig Q1 Gabion retaining wall

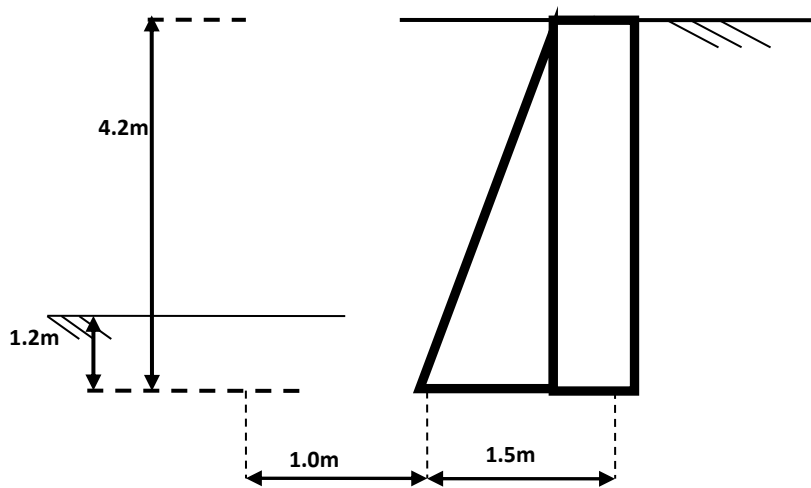


Figure Q1b. Mass concrete Retaining wall