



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

**DIPLOMA IN ARCHITECTURE
DIPLOMA IN CIVIL ENGINEERING**

EBC 2316: FOUNDATION ENGINEERING I

END OF SEMESTER EXAMINATION

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Scientific Calculator*
- *Drawing instruments*

This paper consists of **FIVE** questions

Answer question **ONE** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages
SECTION A (COMPULSORY)

Question 1

A retaining wall is 8m high. The properties of the soil retained are shown on the diagram fig 1.0 below.

Fig 1.0

GWT

- (i) Calculate the active earth pressure on the wall
- (ii) Calculate the resultant total force acting on the wall due to soil pressure and the height above the base of the wall at which it acts.
- (iii) Draw the pressure diagram and find the resultant of the active pressure and the centroid through which it acts. (30 marks)

SECTION B (Answer any TWO questions from this section)

Question 2

a) Define the following terms

- (i) Compression index
- (ii) Co-efficient of volume change
- (iii) Co-efficient of compressibility (6 marks)

b) A 2m wide strip footing is founded at a depth of 1.5m below the ground level in a homogeneous bed of dense sand, having the following properties

$$\phi = 36^\circ \quad \gamma = 1.85t / m^3$$

Determine;

- (i) The ultimate bearing capacity
- (ii) The net ultimate bearing capacity
- (iii) Safe bearing capacity

$$\phi = 36$$

Given for $N_c = 60, N_q = 42, N_{\gamma} = 47$

Assume a factor of safety of 3.0

(14 marks)

Question 3

a) Explain the following modes of failure

- (i) General shear failure
- (ii) Local shear failure
- (iii) Punching shear failure

(6 marks)

b) A raft footing is to be constructed on a 7.5m thick clay layer which lies between two sand layers. In order to predict the time rate of settlement of the building, a 2.5cm thick undisturbed sample of the soil was tested in the laboratory under double drainage condition. The sample was found to have undergone 50% in 12.5 minutes. Determine the time required for 50% settlement of the building.

(14 marks)

Question 4

A square footing 2.5m x 2.5m is built on a homogeneous bed of sand of density 19KN/m³ having an angle of shearing resistance of 36°. The depth of foundation is 1.5m below the ground surface. Calculate the safe load that can be applied on the footing with a factor of safety of 3. Take bearing capacity factors as

$$N_c = 27, N_q = 30, N_{\gamma} = 35$$

(20 marks)

Question 5

A cohesionless backfill with horizontal surface has a weight of 18.2 KN/m³ and carries a uniformly distributed surcharge of 25KN/m². The active lateral earth pressure at a point 6m down the top of the retaining wall 12m high is measured to be 35KN/m². What is the magnitude, direction and point of action of the total Rankine active lateral force against the wall

(20 marks)