



# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

*Faculty of Engineering and Technology*

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

**HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING**

EBC 3216: FOUNDATION ENGINEERING I

**END OF SEMESTER EXAMINATION**

SERIES: AUGUST/SEPTEMBER 2011

**TIME: 3 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer booklet*
- *Scientific Calculator*
- *Chart 4 (Bearing capacity factors chart)*

This paper consists of **FIVE** questions

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **FOUR** printed pages

## SECTION A (COMPULSORY)

### Question 1

- a) With aid of sketches, explain the **THREE** types of pressure in regard to lateral earth (6 marks)
- b) State the **FOUR** assumptions made in Rankines theory of earth pressure (4 marks)
- c) Fig 1 shows the section of a shallow foundation. Using the information given and Chart 4 (Terzaghi's bearing capacity factors for shallow foundations), calculate the safe bearing pressure when water level is at:
- The ground level
  - Base of the foundation (10 marks)

- d) With the aid of sketches, briefly explain **TWO** modes of shear failure below footings (10 marks)

## SECTION B (Answer any TWO questions)

### Question 2

- a) (i) Briefly explain the effect of vegetation on bearing capacity of soils and measures taken to address the problem
- (ii) A square footing of sides 1.2m x 1.2m is founded on sand of density 1800kg/m<sup>3</sup>  
 $N_{\phi} = 50$
- The angle of internal friction is 36°. If  $N_q = 43$ , determine the ultimate bearing Capacity when the footing is:
- On the ground surface
  - At a depth of 1.5m below the ground surface (11 ½ marks)
- b) Explain the following terms in regard to consolidation.

- i) Fully consolidated soil
- ii) Normally consolidated soil
- iii) Over-consolidated soil (4 ½ marks)

c) Briefly explain the effects of water in regard to earth retaining structures (4 marks)

### Question 3

a) State **FIVE** assumptions made in Terzaghi's theory of consolidation (5 marks)

b) During a consolidation test, a sample of fully saturated clay soil 30mm thick was consolidated under a pressure increment of 196.2 KN/m<sup>2</sup>. At the end of the experiment the sample thickness was 26mm. While being allowed to expand the sample thickness increased to 28mm and its moisture was 24%. Determine the void ratio before and after consolidation. Take specific gravity of particles as 2.70 (10 marks)

c) Explain the following terms as applied to theory of consolidation

- (i) Drainage path
- (ii) Coefficient of compressibility (5 marks)

### Question 4

a) The soil conditions adjacent to a retaining wall are given in Fig. 1.0, a surcharge pressure of intensity 50KN/m<sup>2</sup> being carried on the surface behind the wall. Determine the magnitude of the total thrust, indicating its point of application

(16 marks)

b) Explain the following terms used in soils  
(i) Elastic modulus

(ii) Plastic flow

(4 marks)

**Question 5**

a) Briefly explain **TWO** factors which affect bearing capacity

(6 marks)

b) State Terzaghi's equation for shallow strip footing and explain the terms

(4 marks)

c) A rectangular footing of size 8m x 2.5m is to be founded at a depth of 1.55m on a layer of soil. Assuming a factor of safety of 3 and using Chart 4, determine the safe bearing capacity value

Take  $\phi = 15^\circ$ ,  $C = 75\text{KN/m}^2$  and  $\gamma = 20\text{KN/m}^3$

(10 marks)