TECHNICAL UNIVERISTY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING (HDBC 12J)

EBC 3216: FOUNDATION ENGINEERING I

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: MARCH 2014
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Answer **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (20 marks)

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

b) (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 and 1.2m is founded on sand of density 1800kg/m^3. The angle of internal friction is 36°. If N_{γ} = 50 and Nq = 43, determine the ultimate bearing capacity when footing:

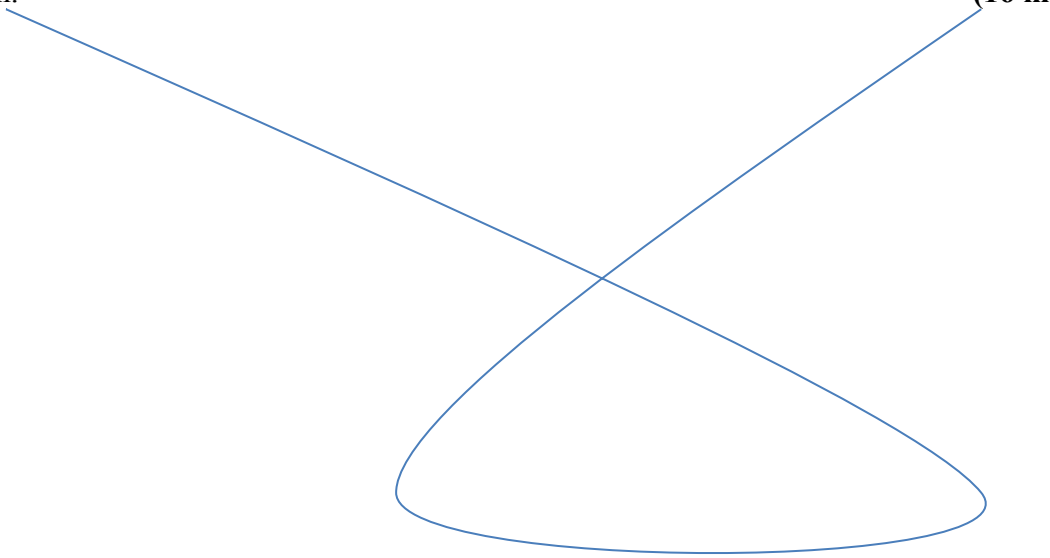
- On the ground surface
- At a depth 1.5m below the ground surface. **(11 ½ marks)**

c) Explain the following terms as applied in consolidation:

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

Question Two (20 marks)

a) The soil conditions adjacent to a retaining wall are given in figure 1. There is a surcharge of 50KN/m^2 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 Three (20 marks)

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

b) Explain the following terms as applied in theory of consolidation:

(i) Draining path

(ii) Coefficient of compressibility **(5 marks)**

c) During a consolidation test, a sample of fully saturated clay soil 30mm thick was consolidated under s pressure increment of 196.2KN/m^2. 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. The specific gravity of particles = 2.70. **(10 marks)**

Question Four (20 marks)

a) Figure 2 shows the section of a shallow foundation using the information given and chart 4. (Bearing capacity factors chart), calculate the safe bearing capacity when water level is at:

(i) The ground level

(ii) The base of the foundation **(10 marks)**

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b) The aid of sketches, briefly explain TWO modes of shear failure below footings. **(10 marks)**

Question Five (20 marks)

a) State the FOUR assumptions made in Rankine's theory of earth pressure. **(4 marks)**

b) With the aid of sketches, explain the THREE types of pressure in regard to lateral earth. **(6 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. $\phi = 15^o$

Determine the safe bearing capacity value. Use chart 4. Take Factor of safety as 3: ;
c = 75KN/m^2 and = 20KN/m^3. **(10 marks)**