TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 12J)

EBC 2308: FOUNDATION ENGINEERING

END OF SEMESTER EXAMINATION
SERIES: APRIL 2014
TIME ALLOWED: 2 HOURS

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

- *Answer booklet*
- *Scientific Calculator*
- *Mathematical Table*

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

Question One

a) Define the following:
   (i) Ultimate bearing capacity
   (ii) Allowable bearing capacity **(4 marks)**

b) Explain the THREE considerations that a foundation is expected to satisfy. **(6 marks)**

c) A footing 2.5m square is located at a depth of 1.5m in dense sand of shear strength parameters $\theta' = 40^o$
   c' = 25KN/m^2. Determine ultimate bearing capacity using figure 1 provided for the following cases.
   (i) Ground water level at foundation level
   (ii) Ground water level at the surface
   (Take δ_b = 17KN/m^3, δ_{sat} = 20KN/m^3) **(10 marks)**

Question Two

a) Briefly describe the general mode of shear failure that can occur in a soil below a foundation. **(6 marks)**

b) Explain the terms in Terzaghi's general expression used to determine ultimate bearing capacity. **(3 marks)**

c) A strip footing is designed to carry a safe load of 750KN per meter run at a depth of 0.55m in silty sand. Ground water level is at foundation level considering factor of safety 3 determine using figure 1 the width of the footing. **(11 marks)**

Take: $\phi' = 40^o,\ c' = 0$ $\delta_b = 18KN/m^3$ and δ_{sat} = 21KN/m^3. **(11 marks)**

Question Three

a) Outline the procedure for standard penetration test. **(8 marks)**

b) Explain the adjustment needed if a standard penetration test is done below water table. **(2 marks)**

c) Explain the effect of ground water on foundation settlement. **(4 marks)**

d) A circular footing 2.0m diameter is to be located at a depth of 1.5m in a sand deposit of =18KN/m^3 standard penetration resistance number obtained from standard penetration test conducted was found to be 25. Use figure 2 provided to estimate allowable bearing capacity. **(6 marks)**

Question Four

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

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

(i) Coefficient of volume compressibility
(ii) Drainage bath
(iii) Pre consolidation pressure **(7 marks)**

c) A fully saturated clay soil 30mm thick was consolidated under a pressure increment of 200KN/m^2. The sample thickness was 26mm at end of the test and 28mm on expansion. Moisture content was then tested and found to be 21.5%. If particle specific gravity for the soil was 2.68, find the void ratio at the following stages:
(i) At the beginning of the test
(ii) At the end of the test **(8 marks)**

Question Five

a) Distinguish between a normally consolidated and over consolidated soil. **(2 marks)**

b) Briefly explain the term "primary consolidation" and its significance. **(3 marks)**

c) A saturated sample of clay soil of particle specific gravity 2.68 was tested in an oedometer. The moisture content for the sample was found to be 23%. Test results obtained were:

Incremental Stage	Pressure (KN/m^2)	Sample thickness (mm)
1	50	26.0
2	100	25.6
2	200	25.2
3	400	24.9
4	800	24.7
5	0	25.2

(i) Determine void ratio at beginning and at the end of test
(ii) Draw a graph of thickness against pressure
(iii) Use the graph obtained to find coefficient of volume compressibility at pressure P = 400KN/m^2
(15 marks)