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 3102: SOIL MECHANICS II

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Scientific Calculator*

This paper consists of **FIVE** questions in two sections **A** & **B**
Answer question **ONE (COMPULSORY)** and any other **TWO** questions.
Maximum marks for each part of a question are clearly shown
This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question 1

a) With the aid of sketches, describe the **FOUR** main types of slope failures (8 marks)

b) The bank of a canal has the profile shown in fig. 1. The material is homogenous clay of density 2000kg/m^3, cohesion 30KN/m^3 and the angle of shearing resistance zero. For the trial slip circle shown, the area ABCDE is 200m^2 and the centroid is at G. Find the factor of safety for this slip circle if the water in the canal is level with the top of the bank (5 marks)

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c) State **FOUR** objectives of site investigation (8 marks)

d) (i) Define the term soil erodibility

(ii) Briefly explain characteristics that enable a soil to have greater resistance to erosion
(iii) Give **THREE** examples of soils that have great resistance to erosion (4 ½ marks)

e) With the aid of a sketch, briefly describe the Standard Penetration Test (SPT) (4 ½ marks)

SECTION B (Answer any TWO questions from this section)

Question 2

a) (i) Explain the **TWO** main types of slopes giving TWO examples of each
(ii) Explain the concept of failure in slopes
(iii) Explain how resistance to failure in slopes is achieved (8 marks0

b) A cutting in a cohesive soil has a slope angle of 35° and a vertical height of 9m. Using Tailors stability number method, determine the factor of safety against shear failure for the following cases

(i) $\phi_u = 0$ Cu = 40KN/m^2, γ = 19KN/m^3 Df is large

(ii) Cu = 40KN/m^2, $\phi_u = 0$ = 19KN/m^3 Df = 1.5

(iii) Cu = 25KN/m^2, $\phi_u = 15^o$ = 19.5KN/m^3 (12 marks)

Question3

a) Name and explain the **FOUR** factors that control the rate and magnitude of soil erosion by wind. (12 marks)

b) Distinguish between sheet and Rill erosion, stating how each occurs (8 marks)

Question 4

a) With the aid of a sketch, describe the Cone Penetration Test (C.P.T)

b) A Square foundation of 3.5m side is to be founded at a depth 1.5m in medium sand (ɣ = 19.4KN/m^3). During site investigations a standard penetration test produced the following values:

Depth (m)	1.4	2.2	3.0	3.8	4.6	5.4
N value	7	9	12	12	17	20

Determine an estimate for the allowable bearing capacity based on a maximum settlement of 25mm. (10 marks)

Question 5

a) Describe the method of sampling using Piston sampler (10 marks)

b) (i) State the most common form of engineering failure of a slope
(ii) State the cause of the failure in (b) (i) above, stating how it affects various ground conditions (5 marks)

c) Briefly explain the importance of rainfall intensity and runoff in assessing a water erosion problem (5 marks)