



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

((A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING (HDBC)

EBC 3302: SOIL MECHANICS II

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Scientific Calculator*

- Charts 11.9&11.7

This paper consists of **FIVE** questions. Answer any **THREE** questions

Maximum marks for each part of a question are as shown

This paper consists of **FOUR** printed pages

Question One (20 marks)

- a) State **FIVE** Objectives of site investigation. **(10 marks)**
- b) A square footing of 3.0m side is to be founded at a depth of 1.5m in medium sand ($\gamma = 19.4\text{KN/m}^3$). The water table is located at a depth 3m. During site investigation, a standard penetration Test Produced the following values:

TABLE 1:

DEPTH (M)	1.3	2.1	3.1	3.9	4.2	4.5
N-VALUE	7	9	12	12	17	20

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

Use figure 11.9

(10 marks)

Question Two (20 marks)

- a) (i) Define the term soil erosion
(ii) State the **TWO** main agents of soil erosion
(iii) Briefly explain conservation measures put in place to reduce soil erosion by agent in (a) (ii) above. **(9 marks)**
- b) (i) Briefly explain the term soil Erodibility.
(ii) State the **THREE** factors that provide soil Erodibility. **(5 marks)**
- c) Explain the **THREE** aspects of soil erosion due to slope gradient and length. **(6 marks)**

Question Three (20 marks)

- a) With the aid of a sketch, describe slope failure due to Rotational slips. **(5 marks)**
- b) The bank of a canal has the profile shown in figure 1. The material is homogeneous clay of density 2050kg/m^3 , cohesion 30KN/m^2 and angle of shearing resistance zero. For the trial slip circle shown, the area ABCDE is 158m^2 and the centroid is at G Find for each of the following conditions the factor of safety for this slip circle:
i) If the water in the canal is level with the top of the bank
ii) If the canal is empty

In both cases, allow for a tension crack 3m deep which may be filled with water. **(15 marks)**

Question Four (20 marks)

- a) Name and outline **THREE** factors that influence methods used in site investigation. **(9 marks)**
- b) Outline the plate loading test. **(11 marks)**

Question Five (20 marks)

- a) A cutting in a saturated clay is inclined at a slope of 1 vertical: 1:5 horizontal and has a vertical height of 9.0m. The bulk unit weight of the soil is 18.5KN/m^3 and its undrained cohesion is 40KN/m^2
($\phi_u = 0$)

5.0m

Determine the factors of safety against immediate shear failure along the slip circle shown in figure 2:

- i) Allowing for tension crack
- ii) Allowing for the tension crack empty of water and;
- iii) Allowing for the tension crack when full of water.

$$\theta = 84.06^\circ$$

Take: Sector Angle

$$\text{Area of slip mass} = 77.35\text{m}^2$$

$$d = 6.0\text{m}$$

$$\theta_c = 67.44^\circ$$

And Sector Angle

$$\text{Area of slip mass} = 71.64\text{m}^2$$

$$d = 5.2\text{m}$$

(12 marks)

- b) Briefly outline the non-drilling method using Hand-Anger

(8 marks)