



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF ENGINEERING
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR FIRST SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL
ENGINEERING

BCECD 303: SOIL MECHANICS II

DATE: 11/12/2017

TIME: 8.30-10.30 AM

INSTRUCTIONS

- This paper comprises of **five** questions. Answer **three** questions.
- Question **one** is **compulsory** and carry 30 marks
- Answer any **other two** questions

- a) Using elaborate sketches, explain **three** modes of slope failure. (9 marks)
 - b) Show that for an undrained stability soil conditions where $\phi = 0$, the factor of safety against slip F is given by the expression $F = \frac{c\theta r^2}{wd}$ (9 marks)
 - c) Explain **six** stages of carrying out site investigation (12 marks)
- a) State any **four** factors influencing a method of site investigation to be employed on any given site (4 marks)
 - b) Explain **five** objectives of site investigation (10 marks)
 - c) Explain the procedure of carrying out the Sand Replacement Test in the determination of soil density on a given site. (6 marks)
- a) Define the term 'Soil conservation' (1 mark)
 - b) State **four** causes of soil erosion (4 marks)
 - c) Explain any **four** methods of preventing soil erosion (8 marks)

- d) Outline the general procedure of presenting a site investigation report (7 marks)
- 4 Figure 1 below shows a cutting in a saturated soil is inclined at a slope of 1 vertical: 1.5 horizontal and has a vertical height of $9.1m$. The bulk unit weight of the soil is $17.8kN/m^3$ and its undrained cohesion is $50kPa$. Determine the factors of safety against immediate shear failure along the slope circle;
- i Ignoring the tension crack
 - ii Allowing for the tension crack empty of water
 - iii Allowing for the tension crack when full of water (20 marks)
- 5 a) Explain **four** soil conservation techniques (8 marks)
- b) The slope of a water retaining embankment is 1 vertical: 2 horizontal and the vertical height is $10m$ as shown in Figure 2 below. Given that the soil is fully saturated and has an undrained cohesion of $42kPa$ and a unit weight of $20kN/m^3$; Determine the factor of safety against shear failure along the trial circle;
- i. When the water level is at the toe of the slope
 - ii. When the water level is $5.5m$ above the toe (12 marks)