



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC IN CIVIL ENGINEERING

ECE 2508: GEOTECHNICAL ENGINEERING

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 09 May 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, Drawing Instruments, Scientific calculator, examination pass and student ID

This paper consists of five questions. Attempt question ONE (Compulsory) and any other TWO questions.

Question One (Compulsory)**(30marks)**

- a) Define the following terms used in geotechnical properties of rock discontinuities,
- i) Spacing (1mark)
 - ii) Persistence (1mark)
 - iii) Aperture (1mark)
 - iv) Filling. (1mark)
- b) With the aid of sketches, explain the following structural terms;
- i) Bedding planes (2marks)
 - ii) Faults (2marks)
 - iii) Folds (2marks)
 - iv) Joints (2marks)
 - v) Dykes (2marks)
- c) Briefly discuss **five** factors affecting the selection of a dam site. (10marks)
- d) A soil sample in its natural state has a mass of 2.29kg and a volume of 1.15×10^{-3} . Under an oven dried state, the dry mass of the sample is 2.035kg. The specific gravity of the solids is 2.68. determine the following;-
- i) Total density (1mark)
 - ii) Water content (1mark)
 - iii) Porosity (1mark)
 - iv) Degree of saturation (1mark)
 - v) Void ratio. (1mark)
- e) Define Geotechnical Engineering (1mark)

Question Two**(20marks)**

- a) i) What is Ground Investigation? (2marks)
- ii) Briefly describe the main objectives for ground investigation. (8marks)
- b) Explain the Electrical Resistivity Sounding method for ground investigation. (10marks)

Question Three**(20marks)**

- a) What are Geosynthetics? (5marks)

b) Briefly discuss **five (5)** types of geosynthetics. Include their functions. **(15marks)**

Question Four

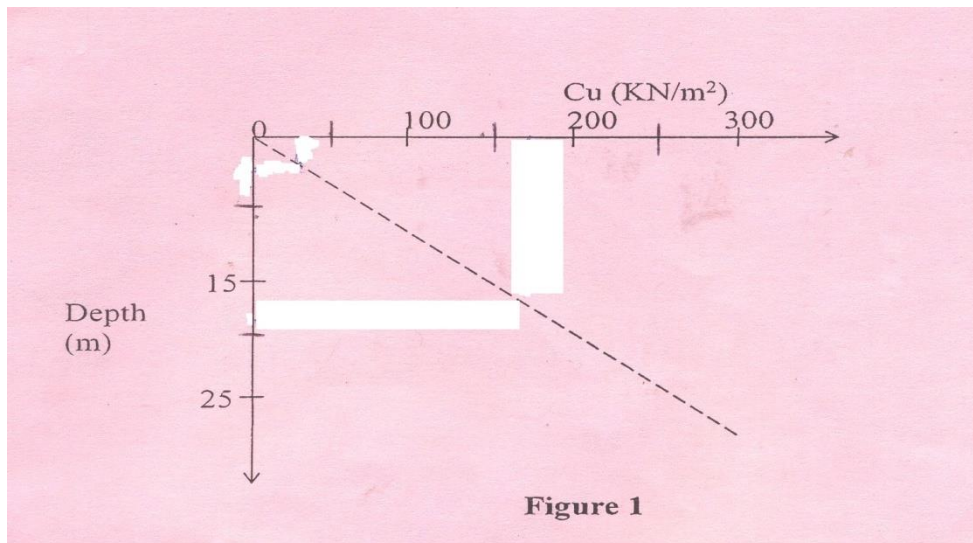
(20marks)

- a) Define a Tunnel. **(2marks)**
- b) Explain 'Stand-up time' in tunnel construction. **(2marks)**
- c) What are the factors that determine the stand-up time? **(6marks)**
- d) Briefly discuss the following types of earth dams; i) Diaphragm dam, ii) Homogeneous dam **(10marks)**

Question Five

(20marks)

- a) Describe three types of Piles according to their materials composition. **(5marks)**
- b) Explain **seven (7)** circumstances where piles can be used. **(7marks)**
- c) An under-reamed bored pile is to be installed in stiff clay. The diameters of the pile shaft and under-reamer base are 1.05m and 3.0m respectively. The pile is to extend from a depth of 4m to a depth of 22m in the clay, the top of the under-reamer being at a depth of 20m. The relationship between undrained shear strength and the depth is as shown in Fig. 1. The adhesion coefficient α is 0.4. Bearing capacity factor $N_c = 9$



Determine the allowable load on the pile to ensure;

- i) An overall load factor of 2
- ii) A load factor of 3 under the base when shaft resistance is fully mobilized. **(8marks)**

