THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2508: GEOTECHNICAL ENGINEERING

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions.

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Explain Geotechnical Engineering and highlight its importance in civil engineering. **(4 marks)**

b) Outline some of the important soil properties used by geotechnical engineers to analyze site conditions for design purposes. **(8 marks)**

c) Explain the meaning of the following structural terms:

(i) Folds

(ii) Faults

(iii) Joints

(iv) Dykes

(v) Bedding planes **(10 marks)**

d) State the objectives of site investigation, explaining the **THREE** phases of site investigation prior to the design of major works. **(8 marks)**

Question Two

a) Geotechnical report arising from site investigation falls into two categories. Briefly describe the two categories. **(4 marks)**

b) Briefly describe three field tests commonly used in subsurface soil investigation for foundations. **(6 marks)**

c) Explain the principal objectives of insitu field testing. **(6 marks)**

d) Explain "frost action" in soils and how this problem can be solved. **(4 marks)**

Question Three

a) Outline **FOUR** functions of geotextiles when they are incorporated into a soil structure. **(8 marks)**

b) What are geosynthetics? **(4 marks)**

c) Write short notes on the following types of geosynthetics.

(i) Geogrids
(ii) Geonets
(iii) Geomembranes
(iv) Geosynthetic clay liners **(8 marks)**

Question Four

a) Outline the main functions of geosynthetics. **(10 marks)**

b) Explain how ground conditions and environmental aspects can influence choice of tunneling methods. **(6 marks)**

c) Briefly describe a dam. **(4 marks)**

Question Five

a) Define a "pile" **(2 marks)**

b) Using an illustration; explain the parts of a pile. **(8 marks)**

c) An under-reamed bored pile is to be installed in a 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 below. The adhesion coefficient α is 0.4. **(10 marks)**

Figure 1

Determine the allowable load on the pile to ensure:

a) An overall load factor of 2.
b) A load factor of 3 under the base when shaft resistance is fully mobilized. **(10 marks)**