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:APRIL2016

TIME:2HOURS

DATE:09May2016

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

Figure 1
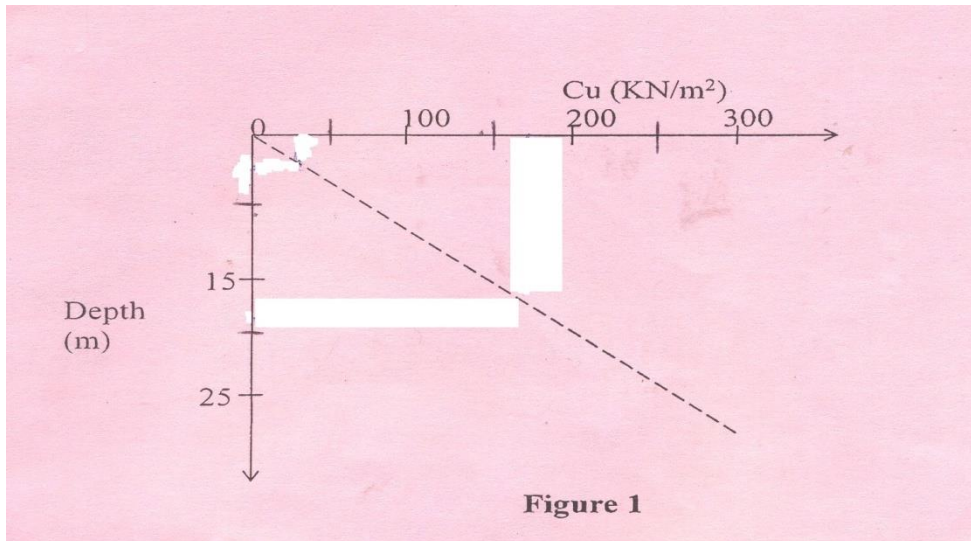
Determine the allowable load on the pile to ensure;

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