THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATIONS FOR DEGREE IN
BACHELOR OF SCIENCE IN BUILDING & CIVIL ENGINEERING

ECE 2303 : SOIL MECHANICS I

END OF SEMESTER EXAMINATION
SERIES: AUGUST/SEPTEMBER 2011
TIME: 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
- *Answer booklet*

This paper consists of **FIVE** questions in **TWO** sections **A & B**
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

<u>**SECTION A (**</u>COMPULSORY**)**

Question 1

a) Define Shear strength as used in soils   (2 marks)

b) Explain the shear box test and procedures followed in the laboratory to test shear strength
                                                                                                                              (10 marks)
c) Explain the following terms as used in soil mechanics   (8 marks)

   (i)   Angle of obliquity
   (ii)   Principal plane
   (iii)   Cohesion
   (iv)   Principal stress

d) A series of shear tests were performed on a soil. Each test was carried out until the sample
    sheared, and the principal stresses for each test were:

Test No.	σ_3 (kN/m^2)	σ_1 (kN/m^2)
1	200	570
2	300	875
3	400	1162

Plot the Mohr stress circles and hence determine the strength envelope and the angle of internal friction of the soil (10 marks)

SECTION B (Answer *any TWO questions from this section*)

Question 2

a) Define coefficient of permeability (2 marks)

b) By use of diagrams, explain **TWO** methods used to determine the coefficient of permeability of coarse and fine sands respectively (10 marks)

c) In a constant head permeameter test the following results were obtained

Duration of test	= 4.0mins
Quantity of water collected	= 300 mls
Distance between manometer tappings	= 100 mm
Head difference in manometer	= 50 mm
Diameter of test sample	= 100 mm

Determine the coefficient of permeability in mn/s (8 marks)

Question 3

a) Define:
   i)   Flow nets
   ii) Flow lines
   iii) Equipotential lines
   iv) Hydraulic gradient
   v)   Hydraulic or Hydrostatic head (10 marks)

b) By use of a diagram, explain **In the Field** permeability test (5 marks)

c) A 9.15m thick layer of sand soil overlies an impermeable rock. Ground water level is at a depth of 1.22m below the top of the soil. Water was pumped out of the soil from the central well at the rate of 5680 kg/min and the draw down of the water table was noted in two observation wells. These two wells were on a radial line from the centre of the main well at a distance of 3.05 and 30.5m
   During the pumping, the water level in the well nearest to the pump was 4.57m below ground leveland in the furthest well was 2.13m below ground level. Determine an average value for the permeability of the soil in m/min (5 marks)

Question 4

a) By use of a diagram, describe a soil profile distinguishing the master and the subordinate layers

(10 marks)

b) By use of diagrams, explain different structures of soils   (10 marks)

Question 5

Explain the **FIVE** factors that affect soil formation   (20 marks)