



TECHNICAL UNIVERSITY OF MOMBASA
**Faculty of Engineering &
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING
DIPLOMA IN BUILDING ENGINEERING (DBCE 12J)

EBC 2207: SOIL MECHANICS I

END OF SEMESTER EXAMINATION
SERIES: APRIL 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Scientific Calculator*

This paper consists of **FIVE** questions.
 Answer any **THREE** questions
 Maximum marks for each part of a question are as shown
 This paper consists of **THREE** printed pages
Question One

- a) State the **FIVE** characteristics upon which soils depend. **(5 marks)**
- b) A clay soil has a bulk unit weight of 19.4 kN/m^3 and a moisture content of 24.3%. If the specific gravity of the soil particles is 2.75, determine:
- (i) Dry unit weight
 - (ii) Void ratio
 - (iii) Degree of saturation
 - (iv) Porosity
 - (v) Saturated unit weight assuming that the void remains constant **(15 marks)**

Question Two

- a) Define the following terms as applied in grading:
- (i) Effective size
 - (ii) Coefficient of uniformity
 - (iii) Coefficient of curvature **(6 marks)**
- b) In a liquid limit test on a fine-grained soil, using a cone penetrometer, the following results were recorded:

Cone penetration (mm)	15.9	17.7	19.1	20.3	21.5
Moisture Content (%)	32.6	42.9	51.6	59.8	66.2

In a plastic limit test on the same soil the plastic limit was found to be 25%. Determine the liquid limit and plasticity index of the soil and classify it according to the British Soil Classification System. Use graph paper provided and figure 1. **(10 marks)**

- c) Briefly explain the determination of Plastic Limit. **(4 marks)**

Question Three

- a) Outline the procedure for carrying out shear box test. **(10 marks)**
- b) In an undrained triaxial test on three specimens of a sandy clay soil the following results were obtained:

Cell pressure (KN/m²)	Deviator Stress (KN/m²)
200	221
400	362
600	505

Draw the Mohr's diagram and determine the apparent cohesion and the angle of shearing resistance. Use the graph paper provided. **(10 marks)**

Question Four

- a) Explain **FOUR** factors that affect permeability. **(8 marks)**
- b) A pumping test was carried out for determining coefficient of permeability of soil in place. A well of diameter 40cm was drilled up to impermeable stratum. The depth of the water bearing stratum was 8m. The yield from the well was $4\text{m}^3/\text{min}$ at a steady draw-down of 4.5m. Determine the coefficient of permeability in m/day if the observed radius of influence was 150m. **(6 marks)**
- c) Outline the variable head permeameter test. **(6 marks)**

Question Five

- a) Outline **THREE** factors that affect soil compaction. **(6 marks)**
- b) Standard Proctor compaction tests carried out on a sample of sandy clay yielded the following results:

Bulk Density (kg/m^3)	2058	2125	2152	2159	2140
Moisture Content (%)	12.9	14.3	15.7	16.9	17.9

Plot the compaction curve and hence find the compaction parameters. Use graph paper provided. **(14 marks)**