



**THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE
(A CONSTITUENT COLLEGE OF JKUAT)**

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING AND CIVIL ENGINEERING (HD/BC/10)

EBC 2302 : SOIL MECHANICS II

SPECIAL/SUPPLEMENTARY EXAMINATIONS

SERIES: MAY 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the followings for this examination:

- (i) Answer booklet,
- (ii) Pocket calculator,
- (iii) Drawing instruments.
 - a. This paper consists of **FIVE** Questions.
 - b. Attempt question **ONE** and any other **TWO** Questions.
 - c. Maximum marks for each part of a question are as shown.

COMPULSORY (30 MARKS)

Question ONE

(a) Define the following terms:

- (i) Principal plane,
- (ii) Principal stress

(2 Marks)

(b) (i) Fig.1 below shows a body of soil acted upon by a major principal stress and a minor principal stress. Graphically or by calculation determine the stresses on plane B-B.

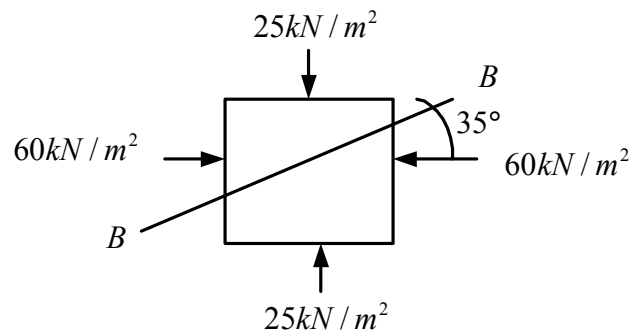


Fig. 1

(10 Marks)

(ii) State and diagrammatically illustrate the **THREE** types of soils on the basis of shear strength only.

(6 Marks)

(c) The following results were obtained from an undrained triaxial test on a soil:

Cell pressure (kN/m ²)	Deviator stress at failure (kN/m ²)
200	700
400	855
600	1040

Determine the coulomb's shear strength equation for the soil.

(12 Marks)

ANSWER ANY TWO QUESTIONS FROM THIS SECTION (40 MARKS)

Question TWO

A granular soil is subjected to a minor principal stress of 200kN/m². If the angle of internal friction of the soil is 29°:

Determine:

- (i) Inclination of the plane of failure to the major principal plane,
- (ii) Inclination of the plane of maximum shear stress to the major principal plane,
- (iii) The stresses on the plane of failure,
- (iv) The maximum shear stress induced in the soil.

(20 Marks)

Question THREE

(a) A shear box test carried out on a soil sample gave:

Test No.	Vertical Stress (kN/m ²)	Horizontal Shear Stress (kN/m ²)
1.	100	79
2.	200	141
3.	300	208

Determine:

- (i) The magnitude of the major and minor principal stresses that would induce failure when the vertical stress on the sample was 200kN/m².
- (ii) The inclination to the horizontal of the major and minor principal planes.

(10 Marks)

(b) Compared with the triaxial test, state:

- (i) **THREE** advantages of the shear box test,
- (ii) **TWO** disadvantages of the shear box test.

(10 Marks)

Question FOUR

For the slope shown in Fig. 4, determine, by the method of slices, the factor of safety:

$$F = \frac{[cr\theta + (\Sigma N) \tan \Phi]}{(\Sigma T)}$$

Symbols have the usual meaning.

(20 Marks)

Question FIVE

- (a) A point load of 600kN acts at the surface of a soil. Using Fig.5.1, determine the vertical stress increase at a point directly beneath the load at a depth of 8.0m. (10 Marks)
- (b) A 4.0M square reinforced concrete foundation exerts a pressure of 350kN/m² on a soil. Using Fig. 5.2, determine the vertical stress increment due to the foundation pressure at a depth of 6.5m below its centre. (10 Marks)