



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATION 2011/2012

**SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE IN CIVIL ENGINEERING**

ECV 308: SOIL MECHANICS II

DATE: THURSDAY, 19TH APRIL 2012

TIME: 2.00 P.M – 4.00 P.M

INSTRUCTIONS:

- (a) This paper contains FIVE (5) questions.
- (b) You are required to answer THREE (3) questions only.
- (c) Question ONE is compulsory.
- (d) Attempt any other TWO questions.
- (e) Question ONE carries 30 marks and the others carry 20 marks each. Answer Question One and ANY TWO questions

SECTION A: COMPULSORY QUESTION ONE-30 MARKS

QUESTION ONE

(Q1a) Describe five primary objectives of site investigation undertaken preliminary to construction of civil engineering and building works **[10mks]**

(Q1b. i) Define the term shear strength of a soil **[2mks]**

(Q1b. ii) A shear box test carried out on sandy clay gave the following results **[8mks]**

Vertical load (Kg)	Divisions of proving ring dial gauge (one division to 1 μ m)
36.8	17
73.5	26
110.2	35
146.9	44

If the shear box is 60mm square and the proving ring constant 20N/ μ m, determine the apparent cohesion and the angle of internal friction for this soil.

(Q1c) Describe any **five** causes of slope failures **[5mks]**

(Q1d) Describe any **five** advantages of soil stabilization **[5mks]**

SECTION TWO-ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO

(Q2a) A 45° slope is excavated to a depth of 8m in a deep layer of saturated clay of unit weight 19 kN/m^3 ; the relevant shear strength parameters are $C_u=65\text{ kN/m}^2$ and $\phi = 0$. Determine the factor of safety for the trial failure surface specified in the figure 1. Check that no loss of overall stability will occur according to the limit state approach. The cross sectional area ABCD is 70 m^2 .

[10mks]

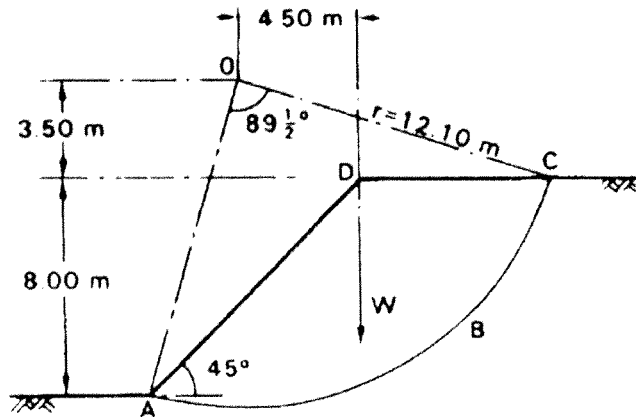


Figure 1. Finite slope

(Q2b) A 5m high road embankment has to be made from a clayey soil with negligible internal friction. The cohesive strength of this soil is 0.2 Kg/cm^2 . A hard stratum is available at 2.5m below the ground surface. Find the safe inclination for the side slopes of the embankment. The unit weight of the soil is 1.7 g/cm^3 . Make use of Taylor's stability chart. F_s is given to be 1.5. [10mks]

QUESTION THREE

(Q3a) Define the following terms as used in ground investigation giving examples of tests requiring each type of sample. [5mks]

- Undisturbed samples and disturbed samples

(Q3b) Outline advantages and disadvantages of direct shear box as a method to determine soil shear parameters [5mks]

(Q3c) the following data refer to three tria-axial tests performed on representative undisturbed samples of a soil. [10mks]

Test	Cell pressure (KN/m^2)	Axial load dial reading-divisions at failure
1	50	66
2	150	106
3	250	147

Load dial calibration factor 1.4 N per division. Each sample is 75 mm long and 37.5 mm diameter. Find by graphical means the value of apparent cohesion and the angle of internal friction for this soil.

QUESTION FOUR

(Q4a) Describe any **five** method used as remedial measures to protect unstable slopes. [10mks]

(Q4b) Describe site reconnaissance study. [5mks]

(Q4c) Describe the following two exploration methods as used in site investigations. [5mks]

- Sounding method and open pit exploration

QUESTION FIVE

(Q5a) Describe techniques used to solve the problem of swelling/collapsible soils in shallow foundations for instance in construction of bungalows houses and roads. [15 mks]

(Q5b) Describe the use of geotextiles in soil reinforcement . [5mks]

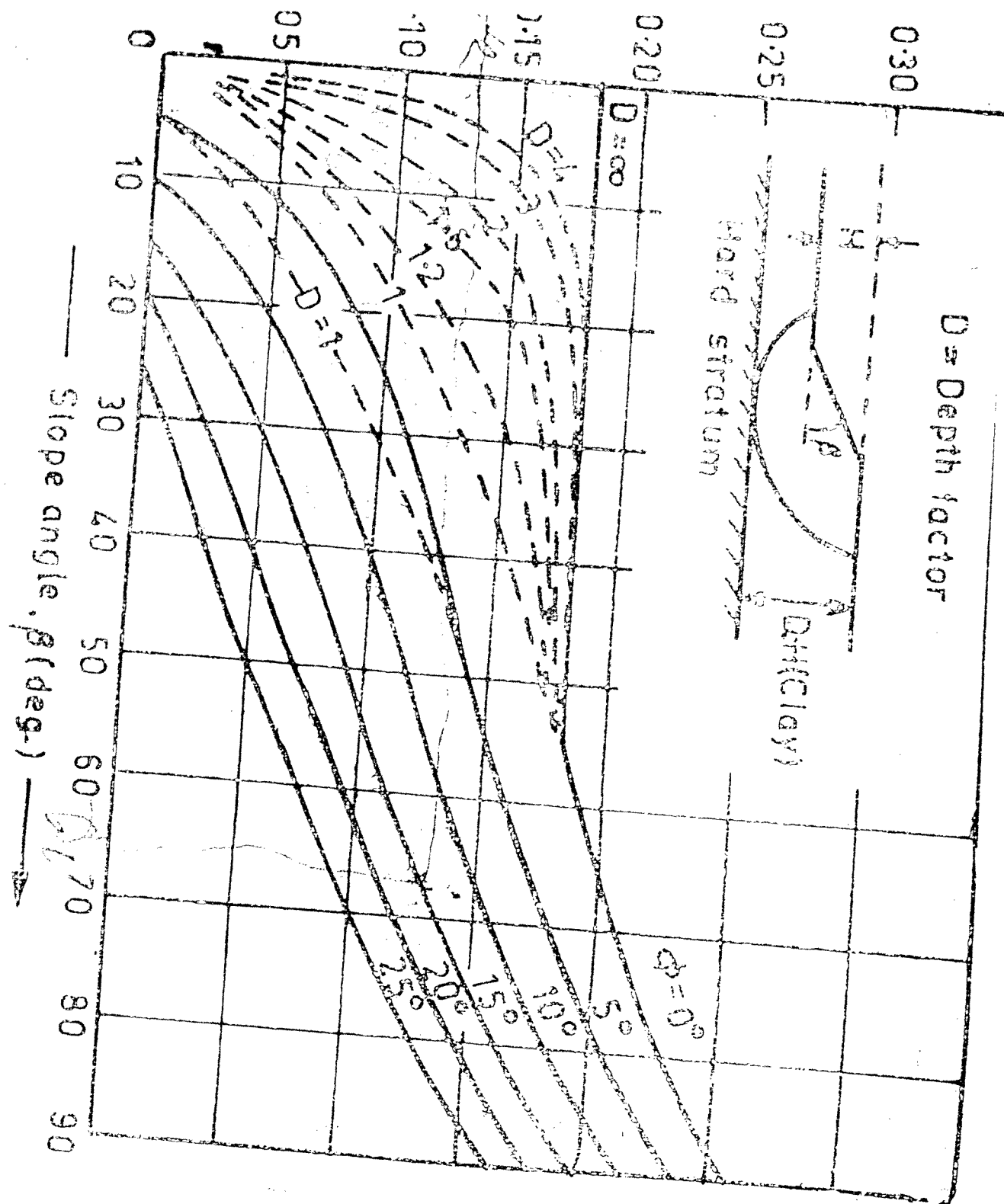


Fig. 14.3. Taylor's Stability charts.