



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of architecture and built environment

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN QUANTITY SURVEYING

ECV 2204 : CIVIL ENGINEERING TECHNOLOGY

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: JULY 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** questions.

Attempt any **THREE** questions.

Do not write on the question paper.

QUESTION ONE (20 Marks)

(a) A sample of soil weighing 35.4 kg had a volume of 0.0186 m^3 . When dried out in an oven, its mass was reduced to 32.7 kg. The specific gravity of the solids was found to be 2.73. Determine the following:

(i) Percentage moisture content

(ii) Bulk density

(iii) Dry density

(iv) Saturated density

(v) Percentage air voids

(12 Marks)

b) Describe Residual Soils, stating typical examples. (8 Marks)

QUESTION TWO (20 Marks)

a) The following data were recorded during a Cone Penetrometer test:

TABLE 1

Penetration (mm)	16.0	18.0	20.0	22.0	24.0
Moisture Content (%)	33.0	43.0	53.0	62.0	72.0

- (i) Determine the liquid limit of the soil
(ii) If the plastic limit of the soil was found to be 36%, determine its plasticity index and classify the use using Plasticity Chart. (12 Marks)

b) Briefly describe the unified classification system of soil. (6 Marks)

c) Define the term linear shrinkage. (2 Marks)

QUESTION THREE (20 Marks)

a) A borehole log gave the following data:

0 - 1.5m Sand - Saturated density 1980 kg/m^3

1.5- 4m Silt - Saturated density 1860 kg/m^3

4 - 7m Clay - Saturated density 2170 kg/m^3

The water table is 4.0m below the ground surface and the soil above the water table is saturated. Calculate the effective pressure at the bottom of the Clay. (7 Marks)

b) Explain the term permeability. (2 Marks)

c) A sheet pile wall was driven to a depth of 7 m into permeable soil extending to a depth of 15 m below per day. Take permeability of the soil to be $6.5 \times 10^{-3} \text{ mm/s}$. (11 Marks)

QUESTION FOUR (20 Marks)

a) During a shear box test on a compacted soil, the following results were recorded:

TABLE 1

Normal Load (N)	122	228	336	444
Shear Load (N)	97	182	265	352

If the size of shear box was 60x60 mm. Determine the shear strength parameters.

(12 Marks)

b) A strip footing of breadth 2.5 m is to be founded at a depth 1.8 m in a soil, which has the following properties:

$C = 14.0 \text{ KN/m}^2$; $\phi = 27^\circ$; $\gamma = 19 \text{ KN/m}^3$

Determine the ultimate bearing capacity: Use Chart 1

- (i) If the water table is well below foundation level
- (ii) If the water table is at the ground surface.

(8 Marks)

QUESTION FIVE (20 Marks)

a) Explain FOUR objectives of ground investigation.

(8 Marks)

b) Describe the local shear failure below footings

(4 Marks)

c) Briefly describe deep-bored wells method of dewatering a site.

(6 Marks)

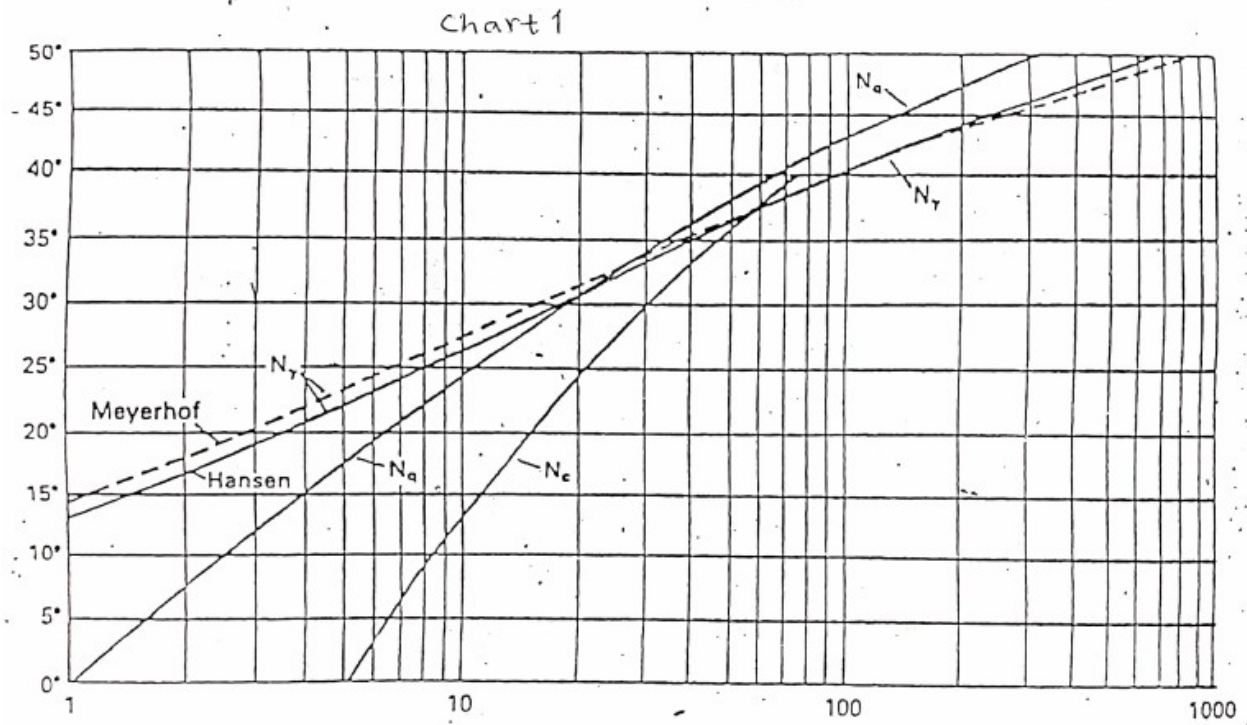
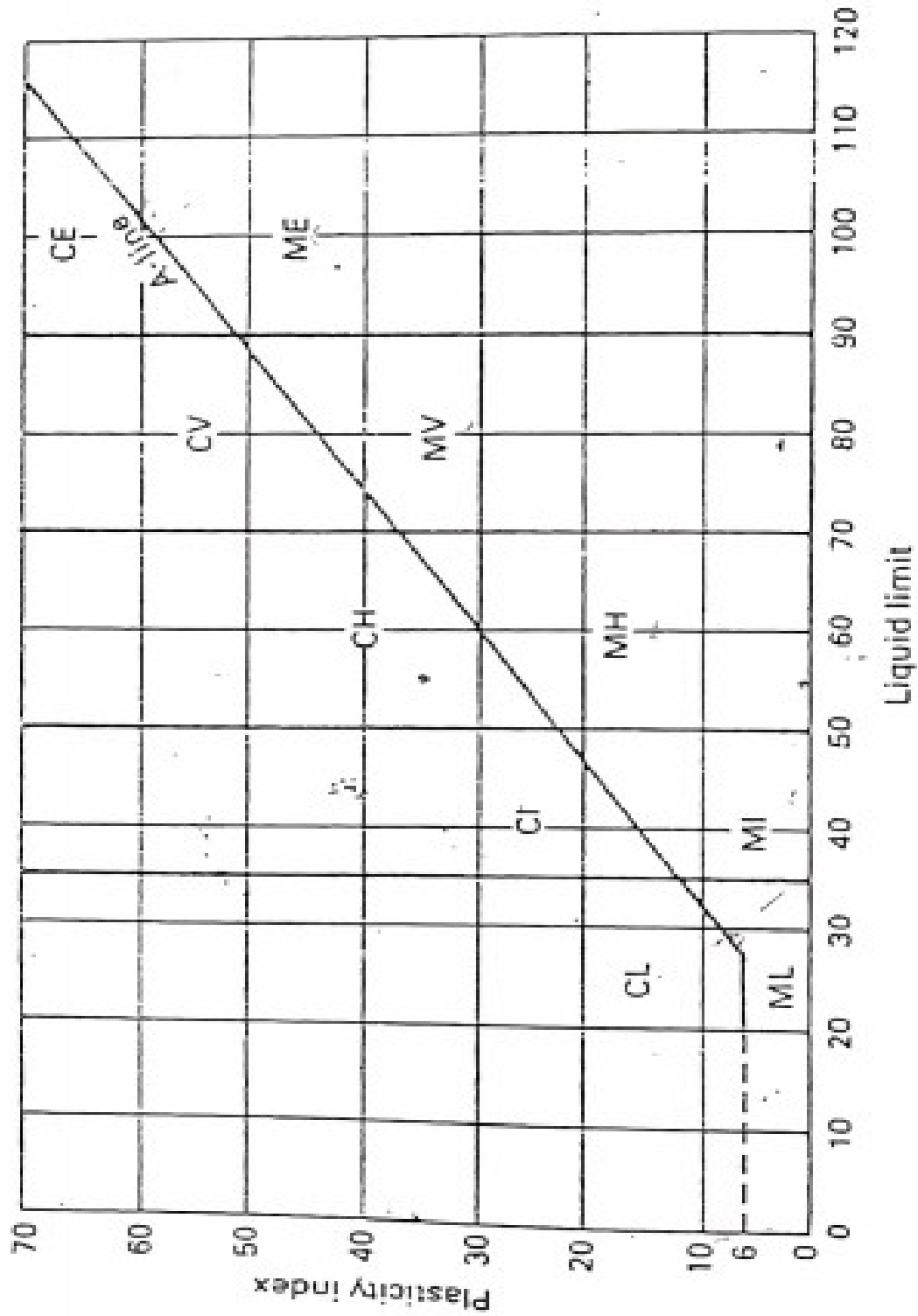


FIGURE 4. BEARING CAPACITY FACTORS
FOR SHALLOW FOUNDATIONS



Plasticity chart: British system. (BS 5930: 1981)

