



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR SPECIAL/ SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING

BCECD 303: SOIL MECHANICS II

DATE: 18/01/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS

Answer Question ONE (Compulsory) and any other TWO questions

Maximum marks for each part of a question are as shown

QUESTION ONE (30 MARKS) - (COMPULSORY)

- a) Briefly explain the following:
- Cohesion
 - Angle of shearing resistance
 - Undisturbed soil (10 marks)
- b) i Explain the term 'shallow footing' as applied to Terzaghi's theory on shallow foundations.
- ii Explain each term that form Terzaghi's theory for bearing capacity. (10 marks)
- b) A square footing 4.2 m x 4.2 m is to be founded at a depth of 2.0m in a sand soil of the following properties:
- $$\phi = 32^\circ \quad C = 0 \quad \gamma_b = 17.5 \text{ KN/m}^3 \quad \gamma_{sat} = 20 \text{ KN/M}^3$$
- Use figure 1 to determine the ultimate bearing capacity considering G.W.L to be;
 - Far below foundation base
 - At the ground surface
 - Comment on the results obtained. (10 marks)

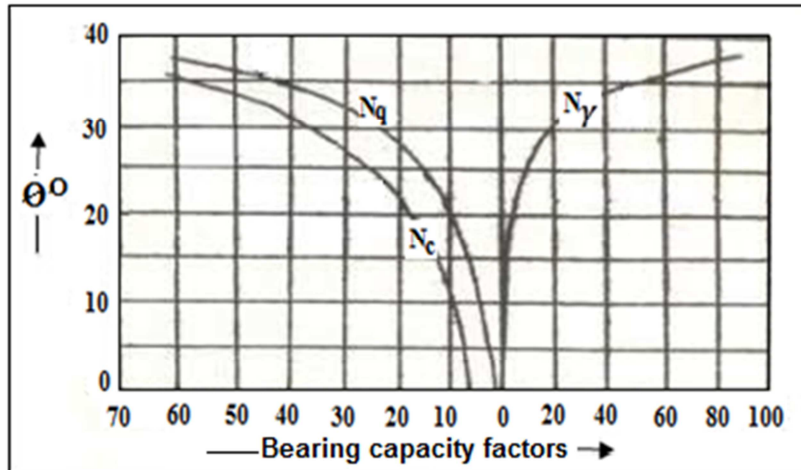


Fig. 1

QUESTION TWO (20 MARKS)

- Outline **THREE** modes of failure for triaxial test samples (9 marks)
- Outline any **ONE** condition of test applied in triaxial tests. (5 marks)
- Sketch typical graphical results expected from an undrained triaxial test.
 - Explain the sketch in (c) (i). (6 marks)

QUESTION THREE (20 MARKS)

- With aid of sketches, outline **THREE** conditions a foundation must satisfy. (12 marks)
- A square footing 2.2m x 2.2m is to be founded at a depth of 2.0m in a sand soil of the following properties: $\phi = 35^\circ$ $C = 15 \text{ kN/m}^2$ $\gamma_b = 17.5 \text{ kN/m}^3$ and $\gamma_{sat} = 20 \text{ kN/m}^3$. Determine the ultimate bearing capacity considering water table to be at foundation level. (8 marks)

QUESTION FOUR (20 MARKS)

- State four assumptions made in Terzaghi's theory that applies to footings. (8 marks)
- A strip footing is to transmit a safe load of 325 kN/m run at a depth of 2m to a ground of the following properties: $C = 18 \text{ kN/m}^2$ $\phi = 20^\circ$ $\gamma_b = 19 \text{ kN/m}^3$. Using figure 2, determine breadth for the footing taking. Take factor of safety $F = 3$. (12 marks)

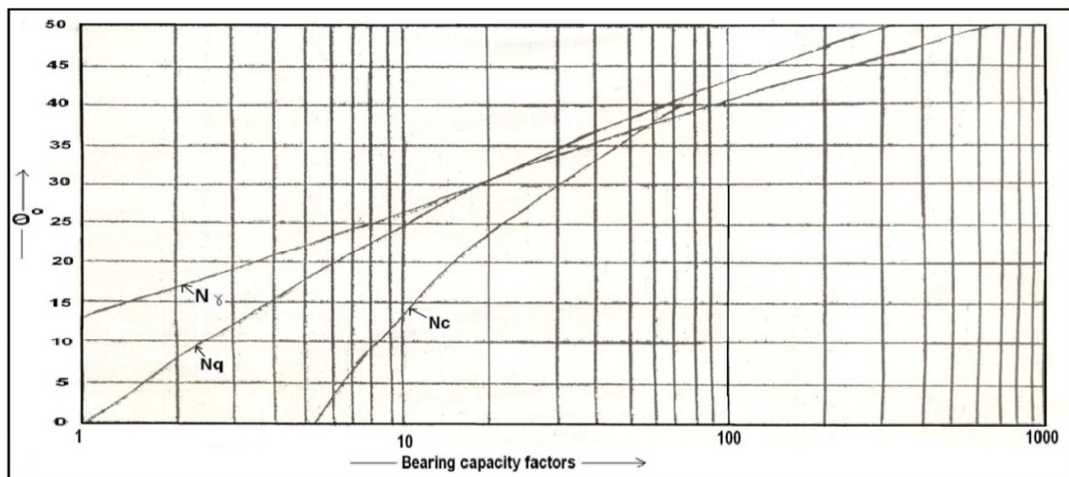


Fig.1

QUESTION FIVE (20 MARKS)

- a) State **TWO** reasons that make the “triaxial shear strength test.” preferred to the direct shear strength test.” (4 marks)
- b) The following results were obtained from drained shear strength tests done on a silty clay soil using a shear box.

Normal stress (KN/m ²)	150	250	350	450
Shear stress at failure (KN/m ²)	89	125	160	195

Determine the shear strength parameters for the soil tested.

(8 marks)

- c) Another specimen similar to the soil in question 5 (a) is to be tested using triaxial apparatus under drained conditions, at a cell pressure of 100KN/m².
- Determine deviator stress that is anticipated to act at failure,
 - Calculate normal stress and shear stress that would develop on plane of failure.

(8 marks)