MACHAKOS UNIVERSITY

University Examinations for 2019/2020Academic 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:

i. Cohesion

ii. Angle of shearing resistance

iii. 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:

$\emptyset = 32^{O}$ C = 0 $\gamma_b = 17.5 KN/m^3$ $\gamma_{sat} = 20\ KN/M^3$

i. Use figure 1 to determine the ultimate bearing capacity considering G.W.L to be;

- Far below foundation base
- At the ground surface

ii Comment on the results obtained. (10 marks)

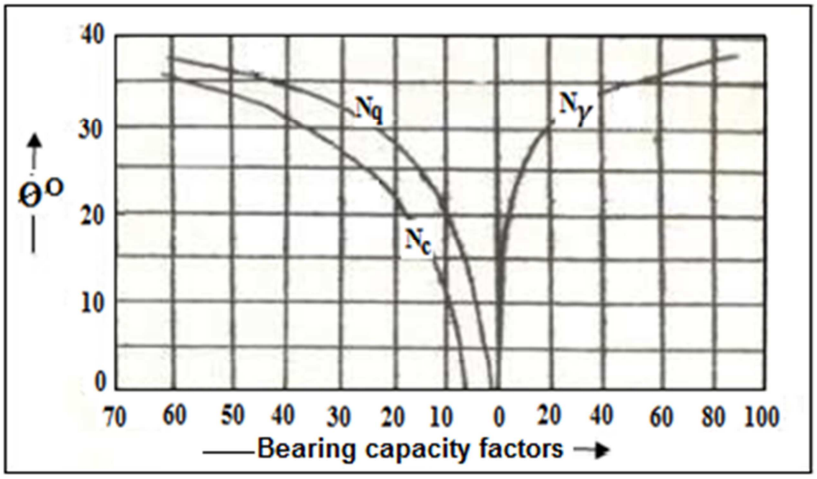

Fig. 1

QUESTION TWO (20 MARKS)

a) Outline **THREE** modes of failure for triaxial test samples (9 marks)

b) Outline any **ONE** condition of test applied in triaxial tests. (5 marks)

c) i Sketch typical graphical results expected from an undrained triaxial test.

ii Explain the sketch in (c) (i). (6 marks)

QUESTION THREE (20 MARKS)

a) With aid of sketches, outline **THREE** conditions a foundation must satisfy. (12 marks)

b) 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: Ø= 35^O C = 15KN/m^2 γ_b= 17.5KN/m^3 and γ_{sat}= 20 KN/m^3

Determine the ultimate bearing capacity considering water table to be at foundation level. (8 marks)

QUESTION FOUR (20 MARKS)

a) State four assumptions made in Terzaghi's theory that applies to footings. (8 marks)

b) A strip footing is to transmit a safe load of 325KN/m run at a depth of 2m to a ground of the following properties: C = 18KN/m^2 Ø = 20^O γ_b= 19 KN/m^3

Using figure 2, determine breadth for the footing taking. Take factor of safety F = 3. (12 marks)

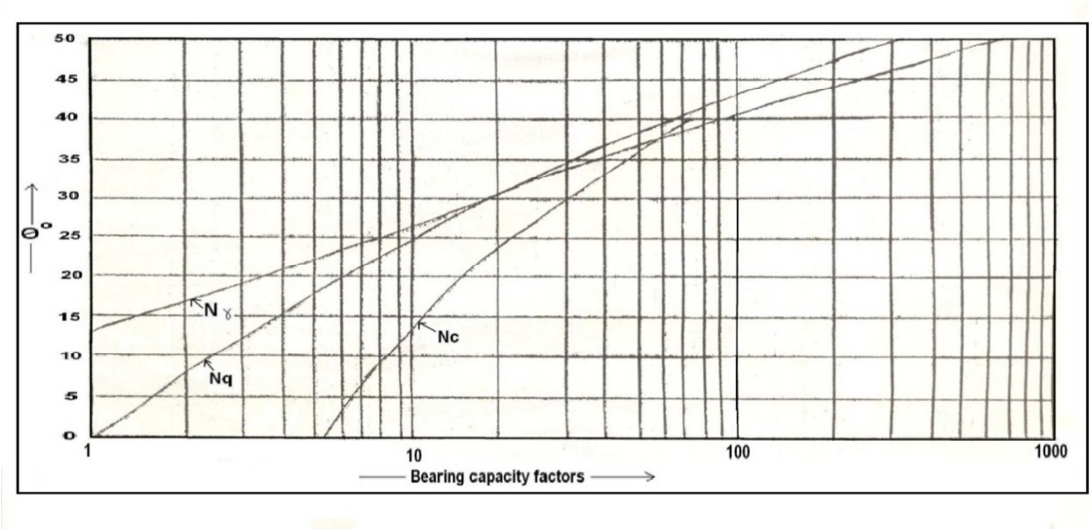

Fig.1

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 $100KN/m^2$.

i. Determine deviator stress that is anticipated to act at failure,

ii. Calculate normal stress and shear stress that would develop on plane of failure.

(8 marks)