# Faculty of Engineering & Technology

# Department of Building & Civil Engineering

## UNIVERSITY EXAMINATION FOR DIPLOMA IN:

## DIPLOMA IN CIVIL ENGINEERING

### DBCE/Jan 2015/S-FT

## EBC 2206: SOIL MECHANICS II

## END OF SEMESTER EXAMINATION

### SERIES: MAY 2016

### TIME ALLOWED: 2 HOURS

**Instruction to Candidates;**

*You should have the following for this examination;*
- *Answer booklet*
- *Pocket calculator*

*This paper consists of FIVE questions. Answer **ANY THREE** questions.*

*Use neat, large and well labelled diagrams where required*

*Maximum marks for each part of a question are as shown*

*This paper consists of **THREE** printed papers.*

**QUESTION ONE**

(a) State **THREE** reasons that make the "triaxial shear strength test." preferred to the direct shear strength test." **(6 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.

(c) Another specimen similar to the soil in 4.0 (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.

**(14 marks)**

**QUESTION TWO**

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

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

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

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

**QUESTION THREE**

(a) (i) Outline **THREE** conditions a foundation must satisfy.

(ii) Briefly describe General mode of failure that can occur beneath a footing.

**(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$^2$   $\gamma_b$= 17.5KN/m$^3$ and $\gamma_{sat}$= 20 KN/m$^3$

Determine the ultimate bearing capacity considering water table to be at foundation level.

**(8 marks)**

**QUESTION FOUR**

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

**(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:  $C = 18KN/m^2$    $\emptyset = 20^O$    $\gamma_b = 19 \ KN/m^3$

Using figure 1, determine breadth for the footing taking. Take factor of safety F = 3.

**(12 marks)**



50
45
40
35
30
$\Theta°$ 25
20
15  N γ
10  Nc
5   Nq
0
1                          10                         100                    1000
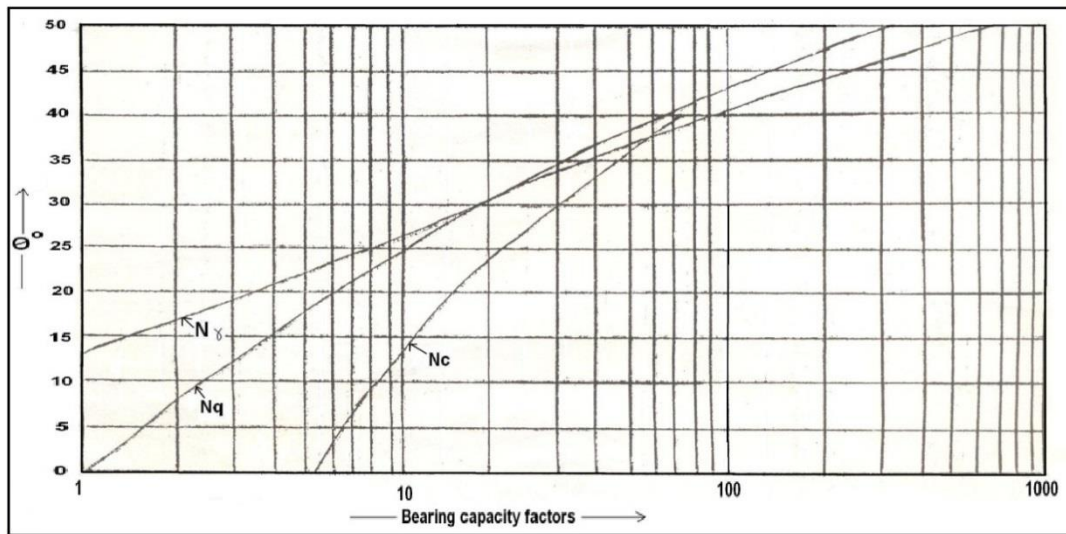— Bearing capacity factors ——→

**FIG.1**

## QUESTION FIVE

Figure 2 shows a retaining wall 10m high supporting cohesionless soils and having a

horizontal surcharge of $12KN/m^2$.

**(a)** Sketch a pressure distribution diagram                               **(15 marks)**

**(b)** Determine **(i)** Magnitude of total active thrust

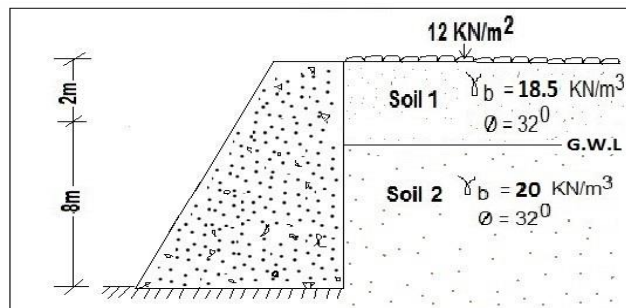**(ii)** Position at which horizontal thrust acts.                    **(5 marks)**



12 KN/m$^2$

2m

Soil 1   $\gamma_b = 18.5 \ KN/m^3$
         $\emptyset = 32^0$
                              G.W.L

8m

Soil 2   $\gamma_b = 20 \ KN/m^3$
         $\emptyset = 32^0$

**FIG.2**