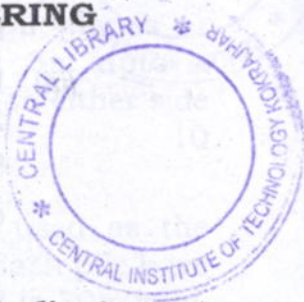**53 (CE 604) FDEN**

2019

FOUNDATION ENGINEERING

Paper : CE 604

Full Marks : 100

Time : Three hours

**The figures in the margin indicate
full marks for the questions.**

Answer **any five.**

1. (a) A plate load test was conducted on a uniform deposit of sand and the following data are obtained : 16

Pressure (kN/m^2)	:	50	100	200	300	400	500	600
Settlement (mm)	:	1.5	2	4	7.5	12.5	20	40

The size of the plate was $750mm \times 750mm$ and that of the pit $3.75m \times 3.75m \times 1.5m$

(i) Plot the pressure settlement curve and determine the failure stress.

(ii) A square footing $2m \times 2m$ is to be founded at $1.5m$ depth in this soil. Assuming FOS against shear failure as 3 and maximum permissible settlement as $40mm$, determine the allowable bearing pressure.

(iii) Design of footing for a load $2000\ kN$ if the water table a greater depth.

Given,

ϕ	N_c	N_q	N_r
35°	57.8	41.4	42.4
40°	95.7	81.3	100.4
45°	172.3	173.3	297.5

(b) Write the difference between the Terzaghi's analysis and Meyarhoff's analysis. 4

2. (a) State the basic assumptions in Boussinesq's theory of stress distribution in soils. Show with sketch the vertical stress distribution on a horizontal plane at a given depth and also the vertical stress distribution with depth. 6

(b) Describe the criteria for selection of the depth of well foundations. 4

(c) A concentrated load of $40kN$ acts on the surface of a soil. Determine the vertical stress increment at points directly beneath the load upto a depth of $10m$ and draw a plot. Also plot the variation of vertical stress increment due to load on horizontal planes at depths of $1m$, $2m$ and $3m$ upto a horizontal distance of $3m$ on either side of centre. 10

3. (a) A group of 12 piles, is used as the foundation of a column. Each pile have a diameter of $500mm$ and is $30m$ long. The piles are arranged in 3 rows and spaced at $1.25m$ c/c. The properties of the foundation soil are as follows :

$\gamma' = 11 kN/m^3$, $C_u = 35 kN/m^2$, $\phi_u = 0$

Assuming $\alpha = 0.8$ and FOS as 2.5, determine the capacity of the pile group. 10

(b) How many types of bearing capacity failure are there ? Explain all types. 10

4. (a) Explain the methods of site explorations. Describe different types of samplers. 6+6=12

(b) Describe the standard penetration test. Explain the corrections of observed N-value.   8

5. *(a)* What are the different criteria for satisfactory action of a machine foundation ?   6

(b) Determine the safe load that can be carried by a square footing of $2m \times 2m$ placed at a depth of $1.5m$ below G.L. The foundation soil has following properties :

$\gamma = 1.65 t/m^3$, $c = 1.4 t/m^3$, $\phi = 20°$,

assume a FOS = 3. Given for $\phi = 20°$, $N'_c = 11.8$, $N'_q = 3.8$, $N'_r = 1.3$.   10

(c) Explain a borehole log.   4

6. Write short notes on : *(any four)* $4 \times 5 = 20$

(a) Vibroflotation

(b) Gronting

(c) Stone column

(d) Critical depth of pile

(e) Components of well foundation.