53 (CE 604) FDEN

2016

FOUNDATION ENGINEERING

Full Marks : 100

Time : Three hours

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

Answer **any five** *questions out of* **six.**

1. (a) What are the assumptions in Boussinesq's theory for finding out stresses in a soil medium ?   5

   (b) What is an isobar ?   5

   (c) What are the different soil improvement techniques ? Write a short note on stone column.   4+6=10

2. (a) Define —   2½×4=10

   (i)   Undisturb sample

   (ii)   Disturb sample

   (iii) Area ratio

   (iv)   Inside Clearance.

   (b) Determine the safe load that can be carried by a square footing of $2m \times 2m$ placed at a depth of $1 \cdot 5m$ below GL. The foundation soil has the following properties— $\gamma = 1 \cdot 65 t/m^3$, $c = 1 \cdot 4 t/m^3$, $\phi = 20°$, assume a F.O.S = 3, Given for $\phi = 20°$, $N'_c = 11 \cdot 8$, $N'_q = 3 \cdot 8$, $N'_\gamma = 1 \cdot 3$.

                                                    10

3. (a) Deduce the expression of ultimate bearing capacity according to Terzaghi's bearing capacity theory.   10

   (b) Explain the terms —   2½×4=10

   (a)   General shear failure

   (b)   Local shear failure

(c) Punching shear failure

(d) Allowable bearing pressure.

4. (a) What is negative skin friction ? 5

(b) What are the design criteria for satisfactory performance of a machine foundation ? 5

(c) 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—
$\gamma' = 11kN/m^3$, $C_u = 35\,kN/m^2$, $\phi_u = 0$
Assuming $\alpha = 0.8$ and F.O.S as 2·5, determine the capacity of the pile group. 10

5. (a) Explain the function of vertical sand drains. 5

(b) Draw the different components of a well foundation. 5

(c) A column of a building carrying a gross vertical load of $150t$, has to be supported by a square footing. The footing is to be placed at $1.2m$ below ground level in a homogeneous bed of soil having the following properties : **10**

$$\gamma = 1.82\,t/m^3,\ \phi = 36°$$

Determine the size of footing required to have a F.O.S. of 3 against shear failure. For $\phi = 36°, N_q = 46, N_\gamma = 50$.

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

   (i) Vibroflotation technique of ground improvement

   (ii) Free vibration and forced vibration

   (iii) Efficiency of a pile group

   (iv) Area ratio of a sampler

   (v) Cement stabilization of soil.