53 (CE 604) FDEN

2018

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** questions out of **six**.

1. (a) What are the different methods of soil
   exploration ?   8

   (b) What are the corrections required for
   the N-values obtained in the field ?
                                                 6

(c) Design a strip footing to carry a load of $750kN/m$ at a depth of $1 \cdot 6m$ in a $C-\phi$ soil having a $\gamma = 18kN/m^3$ and shear strength parameters as $c = 20kN/m^2$ and $\phi = 25°$. Determine width of footing, using a FOS 3 against shear failure. Use Terzaghi's equation for

$\phi = 25°, N_c = 25 \cdot 1, N_q = 12 \cdot 7, N_\gamma = 9 \cdot 7$.

6

2. *(a)* What do you mean by load carrying capacity of piles ? How load carrying capacity of piles can be determined ?

2+8=10

(b) The following data was obtained from a plate load test carried out on a 60cm square test plate at a depth of $2m$ below the ground surface on the sandy soil which extends upto a great depth. Determine the allowable load on $2m \times 2m$ footing with its base at a depth of $2m$ below ground surface, the

permissible settlement for the
foundation $40mm$, FOS '3' 'γ' at test
pit $= 2t/m^3$.   10

Load intensity (t/m^2) :	5	10	15	20	25	30	35	40
Settlement (mm) :	2	4	7.5	11	16.3	23.5	34	43
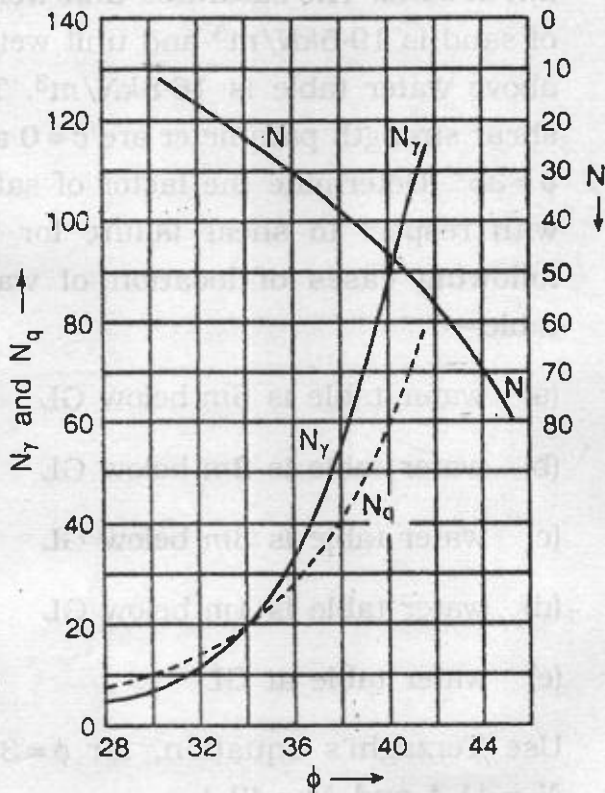
TERZAGHI'S BEARING CAPACITY
FACTORS   FOR TRANSITIONAL STATE.

3. (a) What are the basic requirements of a foundation ? **5**

(b) A strip footing $4m$ wide carries a load intensity of $800kN/m^2$ at a depth of $2m$ in sand. The saturated unit weight of sand is $19 \cdot 5kN/m^3$ and unit weight above water table is $16 \cdot 8kN/m^3$. The shear strength parameter are $c = 0$ and $\phi = 35°$. Determine the factor of safety with respect to shear failure for the following cases of location of water table —

(a) water table is $6m$ below GL

(b) water table is $2m$ below GL

(c) water table is $3m$ below GL

(d) water table is $1m$ below GL

(e) water table at GL.

Use Terzaghi's equation, for $\phi = 35°$, $N_q = 41 \cdot 4$ and $N\gamma = 42 \cdot 4$.

15

4. (a) Describe negative skin friction. How is it calculated for single pile and group pile? What method can be adopted for mitigating negative skin friction?

3+4+3=10

(b) A square pile group of 9 piles passes through a recently filled up material of 4·5m depth. The diameter of the pile is 30cm and pile spacing is 90cm centre to centre. If UCS of the cohesive material is $60kN/m^2$ and $\gamma = 15kN/m^3$, compute the negative skin friction of the pile group. 10

5. (a) What are the assumptions made by Boussinesq for the Boussinesq Equation? Deduce the equations of stress due to a concentrated load acting on ground surface. 3+7=10

(b) Explain the methods of ground improvement techniques by chemical stabilisation. 5

(c) Write a note on grouting technique.

5

6. *(a)* A concentrated point load of $200 kN$ acts at the ground surface. Find the intensity of vertical pressure at a depth of $10 m$ below GL, and situated on the axis of the loading. What will be the vertical pressure at a point at a depth of $5 m$ and at a distance of $2\dot{m}$ from the axis of loading ? 8

(b) What are the different types of samplers ? How a sampler is designed ? Explain the features of sampler.

6+6=12