53 (CE 604) FDEN

2017

FOUNDATION ENGINEERING

Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

1. *(a)* Explain about the load carrying capacity of piles. How load carrying capacity of pile can be determined? Describe *any one* method or formulae of determining load carrying capacity of pile. 3+2+5=10

   (b) A foundation 2·0*m* square is installed 1·2*m* below the surface of a uniform sandy gravel having a density of 19·2 kN/m^3, about the water and a submerged density of 10·1 kN/m^3. The strength parameters with respect to

effective stress are $c' = 0$ and $\phi' = 30°$. Find the gross ultimate bearing capacity for the following conditions —

(i) Water table is well below the base of foundation.

(ii) Water table rises to the base of foundation.

(iii) Water table rises to ground level.

For, $\phi' = 30°$, $Nq = 22$ and $Nr = 20$ 10

2. *(a)* What are the general steps to be followed by concerned engineer in choosing the type of foundation? 6

(b) Design a friction pile group to carry a load of 3000kN including weight of pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average UCS of clay is 70 kN/m^2. The clay may be assumed to be of normal sensitivity and normally loaded with liquid limit 60%. A factor of safety of 3 is required against shear failure. 14

3. *(a)* Explain Meyarhof's theory and what are the assumptions of Meyarhof's theory. Differentiate between Terzaghi's theory and Meyarhof's theory. 5+5=10

(b) 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. 10

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

(b) 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 $3{\cdot}75m \times 3{\cdot}75m \times 1{\cdot}5m$.

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

(ii) A square footing $2m \times 2m$ is to be founded at $1{\cdot}5m$ depth in this soil. Assuming the FOS against shear failure as 3 and maximum permissible settlement as $40mm$, determine the allowable bearing pressure.

(iii) Design of footing for a load $2000kN$ if the water table at great 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

5. (a) What are the methods of site exploration? Explain about the soil samples and samplers? 2+3+5=10

(b) Determine the depth at which a circular footing of $2m$ diameter be founded to provide a factor of safety of 3, if it has to carry a safe load of $1600kN$. The foundation soil has $c = 100kN/m^2$, $\phi = 30°$ and unit weight $= 18kN/m^3$. Use Terzaghi's analysis.

For, $\phi = 30°$, $N_c = 37{\cdot}2$, $N_q = 22{\cdot}5$, $N_r = 19{\cdot}7$ 10

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

(a) Standard Penetration test

(b) Design criteria of machine foundation

(c) Stone column

(d) Settlement of pile group in day

(e) Types of Caissons

(f) Grouting.