53 (CE 604) FDEN

2021

FOUNDATION ENGINEERING

Paper : CE 604

Full Marks : 100

Time : Three hours

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

1. (a) A square group of 9 piles was driven into soft clay extending to a large depth. The diameter and length of piles were $30\,cm$ and $9\,m$ respectively. If the unconfined compressive strength of clay is $9\,t/m^2$ and the pile spacing is $100\,cm$ centre-to-centre, what is the capacity of the group ? Assume FOS of 2·5 and adhesion factor 0·75.　　10

   (b) Describe standard penetration test. What are the corrections needed in the observed SPT 'N' values ?　　10

2. *(a)* What are the pressure diagrams by means of Boussinesq's theory ? Explain and draw the vertical pressure distribution on a horizontal plane due to a concentrated load ?   10

   (b) What is the ultimate bearing capacity of a circular footing of $1 \cdot 5m$ diameter resting on the surface of a saturated clay of unconfined compressive strength of $100 kN/m^2$? What is the safe value, if the factor of safety is 3 ?   10

3. *(a)* Define ground improvement. What are the purposes of ground improvement ?   6

   (b) A plate load-test was conducted on a uniform deposit of sands and the following data are observed :   14

Pressure (kN/m^2) : 50 100 200 300 400 500 600
Settlement (mm) : $1 \cdot 5$ 2 4 $7 \cdot 5$ $12 \cdot 5$ 20 40

   The size of the plate was $750mm \times 750mm$ and that of the pit $3 \cdot 75m \times 3 \cdot 75m \times 1 \cdot 5m$. Considering the unit wt. of the soil $20kN/m^3$.

   (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 the soil.

Assume FOS against shear failure as 3 and maximum permissible settlement as $40mm$, determine the allowable bearing pressure.

(iii) Design the footing for a load $2000kN$, if the water table is at greater depth.

4. (a) What are the types of soil samples? Explain about the types of samples.

$$2+4=6$$

(b) Draw a borehole log. 6

(c) A point load $100kN$ acts on the ground surface. Using Boussinesq analysis, find the maximum vertical pressure on a vertical plane distant 2 metres from the loading. 8

5. Write short notes on : $4 \times 5 = 20$

(a) Vertical sand drain

(b) Types of bearing capacity failures
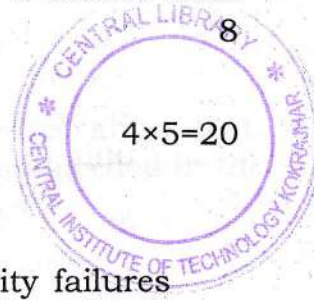
(c) Effects of water table on bearing capacity of shallow foundation

(d) Under-reamed piles

(e) Plate load test.