53 (CE 816) ADFE

2015

ADVANCED FOUNDATION ENGINEERING

Paper : CE 816

Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

"Assumptions made should be clearly stated"
"Use of IS Code is permitted"
*"Illustrate answers with real sketches
whenever required"*

1. (a) Explain the procedure for conducting soil explorations in the field. How the depth of boreholes is effected by significant depth of soil ?   10

(b) Explain Standard Penetration Test in detail. Explain the corrections to be applied to obtain the corrected values of SPT.   10

2. (a) What are the guidelines to be followed while laying out foundation adjacent to the slopping ground ? How the conventional method recommended by CBIP, New Delhi is helpful in finding out the uplift of the footings ?   10

(b) A strip footing $2m \times 2m$ has a tilted base inclined at $10°$ to the horizontal. Estimate its ultimate bearing capacity assuming unit weight of soil as $18 kN/m^3$. Cohesion $25 kN/m^2$ and $\phi' = 25°$. Assume $H = 200kN$, $V = 600kN$ and the average depth of footing is $0.3m$.   10

3. The end column along a property line is connected to an interior column by a trapezoidal footing. The following data are given with reference to Figure-1 :

Column loads : $Q_1 = 2016 kN$, $Q_2 = 1560 kN$,

Size of columns : $0.46 \times 0.46 m$

$$L_C = 5.48m$$

Determine the dimensions 'a' and 'b' of the trapezoidal footing. The net allowable bearing pressure = $190 kPa$.

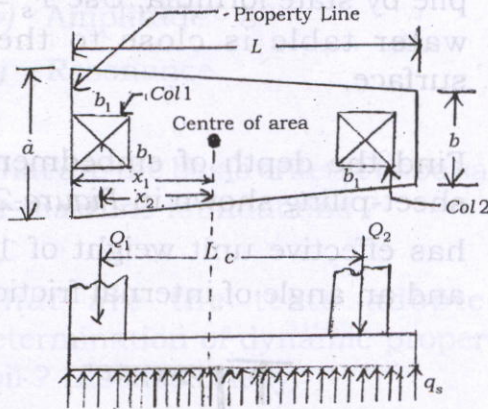*Figure-1*

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4. A nine pile group arranged in a square pattern is used as a foundation for a column in sand $(\phi' = 32°)$. Piles $300mm$ in diameter and $10m$ in length are placed at a spacing of $900mm$ in each direction. Calculate the ultimate load capacity of the pile group. Assume the unit weight of soil as $18 kN/m^3$. Use IS : 2911 Part I recommendation for determining bearing capacity factor, Nq.

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5. (a) A reinforced concrete pile of size $30 \times 30\,cm$ and $10\,m$ long is driven into coarse sand extending to a great depth. The average total unit weight of soil is $18\,kN/m^3$ and the average N-value is 15. Determine the allowable load on the pile by state formula. Use $F_s = 2.5$. The water table is close to the ground surface.

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(b) Find the depth of embedment for the sheet-piling shown in *Figure-2*. The soil has effective unit weight of $17\,kN/m^3$ and an angle of internal friction of $30°$.
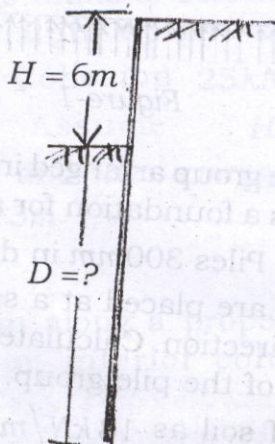
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$H = 6m$

$D = ?$

Figure-2

6. (a) Design the following with respect to machine foundations : 2×5=10

   (i) Degree of freedom

   (ii) Free vibration and forced vibration

   (iii) Frequency

   (iv) Amplitude

   (v) Resonance

   (b) What are the basic criteria to be satisfied for machine foundations ? 4

   (c) What are the tests adopted for determination of dynamic properties of soil ? Discuss briefly. 6

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