53 (CE 816) AFEN

2018

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 planning of a site investigation programme. 10

   (b) How the depth of borehole is effected by significant depth of soil ? What are the factors which govern the nos. of borehole at the site ? 6+4=10

2. *(a)* What are the guidelines to be followed while laying out foundation adjacent to the slopping ground ? What is floating raft ? 8+2=10

(b) Explain the variation of contact pressure and settlement at the base of the flexible and rigid footings. 10

3. *(a)* Calculate the net ultimate bearing capacity of a rectangular footing $2m \times 4m$ in plan founded at a depth of $1{\cdot}5m$ below the ground surface. The load on the footing acts at an angle of 15° to the vertical. The saturated unit weight of the soil is $18kN/m^3$. Here cohesion $c = 15kN/m^2$ and internal friction angle $\phi = 25°$. Natural water table is at a depth of $2m$ below ground level. Use IS : 6403-1981 recommendations. 10

(b) Design a combined trapezoidal footing for two columns $400mm \times 400mm$ and $300mm \times 300mm$ in section carrying loads of $750kN$ and $450kN$ respectively spaced at $3{\cdot}5m$ centre to centre. There is a restriction on extending the footing on the heavier column side by a distance not more than $100mm$. Adopt allowable soil pressure of $130kN/m^2$ for design purposes. 10

4. *(a)* A reinforced concrete pile of size $30 \times 30cm$ and $10m$ long is driven into coarse sand extending to a great depth. The average total unit weight of soil is $18kN/m^3$ and the average N-value is 15. Determine the allowable load on the pile by static formula. Use factor of safety 2·5. The water table is close to the ground surface. 10

(b) It is required to support a tower on bored piles on a site where stiff fissured clay is affected by seasonal swelling and shrinkage movements to a depth of $1{\cdot}0m$. The unconfined compressive strength of stiff clay increases linearly from $40kN/m^2$ at $10m$ to $160kN/m^2$ at $8{\cdot}0m$. Design the pile group for a group efficiency of 100%. Assume a total load = $2500kN$, a F.O.S. equal to 3. 10

5. *(a)* A 8·0 long precast driven pile in cohesionless soil is subjected to a vertical load of $800kN$ and a lateral load of $160kN$ at the top of the pile which is $0{\cdot}2m$ above the ground surface. Determine the maximum moment as well as depth at which maximum moment occurs. 10

(b) What is sheet pile? What are the different types of sheet piles? Derive the expression for the depth of embedment of a cantilever sheet pile in granular soils by approximate method of analysis. 2+2+6=10

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

(i) Damping

(ii) Degree of freedom

(iii) Forced Vibration

(iv) Amplitude

(v) Resonance.

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

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