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 ***all*** *questions.*

"Assumptions" made should be clearly stated"

"Use of IS Code is permitted".

"Illustrate answers with real sketches whenever required".

1. *(a)* Why soil exploration program is necessary ? How the depth of boreholes are determined for : 2+8=10

   (i) Footings placed for apart

   (ii) Footings placed closely

   (iii) Raft foundation

   (iv) Pile and well foundation ?

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

2. (a) What are flexible footing and rigid footing? Explain the variation of contact pressure and settlement at the base of flexible and rigid footings. 4+6=10

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

3. (a) A strip footing of size $2m \times 2m$ has a tilted base inclined at 10° to the horizontal. Estimate its ultimate bearing capacity assuming unit weight of soil as $18kN/m^3$. Cohesion and internal friction angle is $25kN/m^2$ and 25° respectively. Assume $H = 200kN$, $V = 600kN$ and the average depth of footing is $0{\cdot}3m$. 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 $3{\cdot}5m$ c/c. 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. 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 $1{\cdot}0m$ to $160kN/m^2$ at $8{\cdot}0m$. Design the pile group for a group efficiency of 100%. Assume a total load = $2500kN$ and a F.O.S. equal to 3. 20

5. (a) A $8{\cdot}0m$ 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
