Code No: I8705/R16

M.Tech. I Semester Regular Examinations, January-2017

SUB-STRUCTURE DESIGN

(Common to SE and SD)

Time: 3 hours **Max. Marks: 60**

Answer any FIVE Questions
All Questions Carry Equal Marks

1. a List out and explain the Design Considerations of Open Drive Samplers 6
   b How soil samples are classified based on the amount of disturbance in sampling? 6

2. a Explain about the cleaning of bore holes. Why it is required? 6
   b Why the preservation of Soil samples is required? What are the important precautions to be taken against what? 6

3. a What are the criteria for deciding the depth of foundations? Write brief critical notes on tolerable settlements for buildings 6
   b A footing, 2 m square, is founded at a depth of 1.5 m in a sand deposit, for which the corrected value of *N* is 27. The water table is at a depth of 2 m from the surface. Determine the net allowable bearing pressure, if the permissible settlement is 40 mm and a factor of safety of 3 is desired against shear failure. Use Teng's Solution. 6

4. A square footing of 1.5 x 1.5 m in dimension resting on sand at 1.5 m depth. The horizontal force is 0.1 times to the vertical force. Ground slope is 10^0 and base tilt is 10^0. Unit weight of the sand 17.4 kN/m^3, c = 0 and $\phi = 30^0$. The water table at great depth. Using Vesic, Compute the Ultimate Bearing Capacity of the footing. 12

   For $\phi = 30^0$ Vesic bearing capacity factors are → $N_c = 30.13$, $N_q = 18.4$ and $N_\gamma = 22.4$

   Shape factors $S_c = 1 + \frac{N_q}{N_c}\frac{B}{L}$ $S_q = 1 + \frac{B}{L}\tan\phi$ and $S_r = 1 - 0.4\frac{B}{L}$

   Depth factors $d_c = 1.0 + 0.4\,k$, $d_q = 1 + 2\tan\phi(1-\sin\phi)k$ and $d_\gamma = 1.0$; where k = D/B for D/B ≤ 1 and $k = \tan^{-1}(D/B)$ for D/B > 1 (rad)

   Inclination factors, $i_q = \left(1 - \frac{H}{V + A_f c_a \cot\phi}\right)^m$ $i_\gamma = \left(1 - \frac{H}{V + A_f c_a \cot\phi}\right)^{m+1}$ where $m = \frac{2 + B/L}{1 + B/L}$

   H is parallel to B.

   Base factors: $b_c = 1 - \eta/147$, $b_q = b_\gamma = (1 - \eta\tan\phi)^2$

   Ground factors: $g_c = 1 - \beta/147$ and $g_q = g_\gamma = (1 - \tan\beta)^2$.

5. a What are the conditions under which combined footings are used? 6
   b When is a trapezoidal combined footing preferred to as rectangular one? Explain how it is proportioned. 6

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6.	a	Write note on pile groups, their load carrying capacity and efficiency.	6
	b	A pile group consisting of 9 piles is arranged in 3 rows with 3 piles in each row. Diameter of each pile is 40 cm and spacing is 1.2 m. Length of pile is 10 m. The piles are driven completely in clayey soil having unconfined compressive strength of 100 kN/m^2. The piles are designed as frictional. Determine the capacity of pile group	6
7.	a	Explain the basic difference in the bearing capacity computation of shallow and deep foundations. How are skin friction and point resistance of a pile computed?	6
	b	A square pile 25 cm size penetrates into soft clay with unit cohesion of 75 kN/m^2 for a depth of 18 m and rests on stiff soil. Determine the capacity of the pile by skin friction. Assume an adhesion factor of 0.75.	6
8.	a	Explain the circumstances under which a strap footing is used.	4
	b	What are the general considerations in the choice of the foundation type? How is the depth of the foundation determined?	8

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