Code: 9D12104

M.Tech I Semester Regular & Supplementary Examinations February 2016
SHALLOW FOUNDATIONS
(Geotechnical Engineering)
(For students admitted in 2011, 2012, 2013, 2014 & 2015 only)

Time: 3 hours   Max Marks: 60

Answer any FIVE questions
All questions carry equal marks
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1 (a) What do you understand by site investigation? What are the different purposes for which site investigations are done?
   (b) How would you decide the depth of exploration and the lateral extent of investigations?

2 (a) Discuss various types of soil samples for obtaining undistributed samples.
   (b) Explain design features affecting the sample disturbance.

3 (a) How would you fix the depth of foundation?
   (b) Explain the procedure for the design of a: (i) strip footing. (ii) combined footing.

4 (a) Determine the ultimate bearing capacity of a strip footing 1.20 m wide and having the depth of foundation 1.0 m. Use Terzaghi's theory and assume general shear failure. Take $\phi = 35°$, $\gamma = 18 \, kN/m^3$ and $c = 15 \, kN/m^2$, $N_c = 57.8, N_q = 41.4, N_\gamma = 42.4$.
   (b) A footing 2 m square is laid at a depth of 1.3 m below the ground surface. Determine the net ultimate bearing capacity. Use IS code method. Take $\gamma = 20 \, kN/m^3, \phi = 30°, \ c = 0$.

5 Estimate the consolidation settlement of the foundation of size $1m \times 2m$ from the following properties. Take incremental stress as $50 \, kN/m^2$, and water table as 2.5 m from ground level.
   Top layer = sand   H = 2.5 m $\gamma = 16 \, kN/m^3$
   Middle layer = sand   H = 0.5 m $\gamma = 17.5 \, kN/m^3$
   Bottom layer = clay   H = 3 m $\gamma = 16 \, kN/m^3$, LL = 45%

6 Analyze the determination of allowable bearing pressure in sand based on settlement consideration.

7 For a mat foundation with dimensions $18m \times 12m$ the dead and live load on the mat is 45 kN. The mat is to be placed on clay with $C_u = 40 \, kN/m^2$. The unit weight of the clay is $17.6 \, kN/m^3$. Find the depth (D_f) of the mat for a fully compensated foundation. What will be the depth of the mat (D_f) for factor of safety of 3 against bearing capacity failure?

8 Analyze the influence of the rigidity of superstructure on the differential settlement of foundations.

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