Code: 9D12104

M.Tech I Semester Regular & Supplementary Examinations January/February 2017

SHALLOW FOUNDATIONS

(Geotechnical Engineering)

Time: 3 hours Max. Marks: 60

Answer any FIVE questions

All questions carry equal marks

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1 (a) Define the term soil exploration. Explain the need for soil exploration and its objectives.
(b) Explain about the planning of an exploration programme.

2 (a) Explain the terms (i) Inside clearance and (ii) outside clearance as applied to a sampler. Why they are provided?
(b) Compute the area ratio of a thin walled tube sampler having an external diameter of 60 mm and a wall thickness of 2.25 mm. Do you recommend the sampler for obtaining undisturbed soil samples? Why?

3 (a) When is a trapezoidal combined footing is preferred to as a rectangular one? Explain how it is proportioned.
(b) Explain the general considerations in the design of raft foundations.

4 (a) Explain with sketches typical modes of failure and load – settlement curves when a horizontal strip footing resting on the surface of homogeneous soil is subjected to gradually increasing load.
(b) A strip footing, 1.5 m wide, rests on the surface of a dry cohesionless soil having $\phi = 20°$ and $\gamma = 19\ kN/m^3$. If the water table rises temporarily to the surface due to flooding, calculate the percent reduction in ultimate bearing capacity of the soil. Assume $N_\gamma = 5.0$.

5 (a) Sketch typical results of consolidation test data to a suitable plot relating the void ratio and consolidation pressure in each case and show how preconsolidation can be estimated.
(b) In a consolidation test on a soil sample, when the load was changed from 50 KPa to 100 KPa, the void ratio changed from 0.70 to 0.65. Determine the coefficient of volume decrease and compression index.

6 A plate load test was conducted on a uniform deposit of sand and the following data were obtained. The size of the plate was 750 mm x 750 mm.

Pressure (KPa)	50	100	200	300	400	500	600
Settlement (mm)	1.5	2.0	4.0	7.5	12.5	20.0	40.0

A square footing 2 m x 2 m, is to be founded at a depth of 1.5 m below in the same soil. Determine the allowable bearing pressure for a maximum settlement of 40 mm. Also determine the failure stress in the soil.

7 A building which has three basement floors is to be supported on RCC raft foundation of dimensions 14 m x 21 m. The subsoil is clay with unconfined compressive strength of 15 KPa. The pressure on the soil due to the weight of the building and the loads that will carry will be 140 KPa at the base of the raft. If the unit weight of the excavated soil is $19\ kN/m^3$, at what depth should the bottom of the raft be placed to provide a factor of safety of 3 against shear failure.

8 Explain the following:
(a) Interactive and non-interactive problems.
(b) Idealized soil behavior.

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