Code: 9D12101

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

ADVANCED SOIL MECHANICS

(Geotechnical Engineering)

Time: 3 hours Max. Marks: 60

Answer any FIVE questions

All questions carry equal marks

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1 Inorganic clay has a liquid limit of 350 percent.
(a) What is the most probable predominant clay mineral in this soil?
(b) Explain high liquid limit in terms of crystal structure of this mineral.
(c) Would you recommend founding light structures on shallow footings above this soil? Why?

2 Derive governing equation for saturated flow.

3 Explain in detail various clay-water interaction mechanisms in soils.

4 (a) Define pre-consolidation pressure. Describe a suitable procedure for determining the pre-consolidation pressure.
(b) A 3 m thick clay layer beneath a building is overlain by a permeable stratum and is underlain by an impervious rock. The coefficient of consolidation of the clay was found to be 0.025 cm^2/min. The final expected settlement for the layer is 8 cm. Determine: (i) How much time will it take for 80 percent of the total settlement. (ii) The required time for a settlement of 2.5 cm to occur. (iii) The settlement that would occur in one year.

5 (a) Derive the expression for Skempton pore pressure parameters (A and B).
(b) How these parameters can be determined in the laboratory?
(c) The following data relate to a triaxial compression tests performed on a soil sample:

Test No.	Chamber Pressure (kN/m^2)	Max. deviator Stress (kN/m^2)	Pore water Pressure (kN/m^2)
1	80	175	45
2	150	240	50
3	210	300	60

Determine the total and effective stress parameters of the soil.

6 (a) Explain with neat sketches, several possible types of variation for u_i (pore water pressure) with depth of clay layer undergo consolidation and also write down the relationship for u_i and boundary conditions.
(b) Write short notes on normally consolidated clay and over consolidated clay.

7 The equation of the effective stress failure envelope for a loose, sandy soil was obtained from a direct shear test at $\tau_f = \sigma \tan 30°$. A drained triaxial test was conducted with the same soil at a chamber confining pressure of 70 kN/m^2. Calculate the deviator stress at failure.

8 Comment on the mechanisms of primary consolidation and secondary compression in terms of the rate-controlling factors, influences of and effects on soil structure, whether they occur sequentially or concurrently, and the suitability of our usual procedures for quantifying them for geo-engineering analysis.

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