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

(Geotechnical Engineering)

Time: 3 hours

r any EIVE quastions

Max. Marks: 60

Answer any FIVE questions

All questions carry equal marks

- 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 preconsolidation 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 cm²/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 taboratory?
 - (c) The following data relate to a triaxial compression tests performed on a soil sample:

Test	Chamber	Max. deviator	Pore water
No.	Pressure (kN/m ²)	Stress (kN/m ²)	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 $\tau_f = \sigma \tan 30^\circ$. A drained triaxial test was conducted with the same soil at a chamber confining pressure of 70 kN/m². 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.
