

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER M.TECH DEGREE EXAMINATION, FEBRUARY 2016

Civil Engineering
(Geomechanics and Structures)

04 CE 6305 Advanced Soil Mechanics

Max. Marks : 60

Duration: 3 Hours

PART A

Answer all questions

1. Explain diffuse double layer.
2. Define 'neutral' and 'effective' pressure in soils.
3. Explain the effect of secondary consolidation on preconsolidation pressure.
4. Plot failure envelopes of NC and OC clay for drained direct shear test.
5. How is the degree of compaction ensured in the field?
6. Explain creep in soils.
7. Estimate the immediate settlement of a concrete footing 1.5m x 1.5m in size founded at a depth of 1m in silty soil whose modulus of elasticity is 90kg/cm². The footing is expected to transmit a unit pressure of 200kN/m².
8. Write a note on precompression of soil.

(8 x 3 =24marks)

PART B

(Answer all questions)

- 9a. Write notes on (i) Vanderwaals forces (ii) Base exchange capacity and (iii) Soil fabrics.

(6 marks)

OR

- 9b. Name the predominant clay minerals. Explain their structure and composition. **(6marks)**

10a. (a) A masonry dam has pervious sand as foundation. Determine the maximum permissible upward gradient if a factor of safety of 4 is required against boiling. For the sand, $n=45\%$ and $G=2.65$. **(2 marks)**

(b) Compute the total, effective and pore pressure at a depth of 15m below the bottom of a lake 6m deep. The bottom of the lake consists of soft clay with a thickness of more than 15m. The average water content of the clay is 40% and the specific gravity of soils may be assumed to be 2.65. **(4 marks)**

OR

10b.

(a) Explain the meaning of seepage pressure. **(2 marks)**

(b) A foundation trench is to be excavated in a stratum of stiff clay, 10m thick, underlain by a bed of coarse sand. In a trial bore hole, the ground water was observed to rise to an elevation of 3.5m below ground surface. Determine the depth up to which an excavation can be safely carried out without the danger of the bottom becoming unstable under the artesian pressure in the sand stratum. The specific gravity of clay particles is 2.75 and the void ratio is 0.8.

(4 marks)

11a. A clay soil tested in a consolidometer showed a decrease in void ratio from 1.20 to 1.10 when the pressure was increased from 0.25 to 0.50 kgf/cm^2 . Calculate the coefficient of compressibility (a_v) and coefficient of volume change (m_v). If the coefficient of consolidation (c_v) determined in the test for the given stress increment was $10\text{m}^2/\text{year}$, Calculate the coefficient of permeability in cm/s . If the sample tested at the site was taken from a clay layer of 3m in thickness, determine the consolidation settlement resulting from the given stress increment. **(6 marks)**

OR

11b. Explain in detail about the methods used for the determination of consolidation parameters a_v and c_v . **(6 marks)**

12a. Write brief critical notes on (i) Unconfined compression test (ii) Vane shear test. **(6 marks)**

OR

12b. Describe the pore pressure parameters and its uses. **(6 marks)**

13a. Explain different methods of compaction used in the field. **(6 marks)**

OR

13b. Explain anisotropy in undrained shear strength. What is the effect of rate of strain and temperature on the undrained shear strength. **(6 marks)**

14a. The idealized variation of cone penetration resistance below a bridge pier foundation is given below. The foundation plan is 20m x 2m. Given depth of foundation = 2m; $\gamma = 16\text{kN/m}^3$; total foundation pressure, $q = 150\text{kN/m}^2$. Calculate elastic settlement using strain influence factor. Use $t=10$ years.

Layer	Δz (m)	q_c (kN/m^2)	I_z
1	1	2000	0.275
2	1	4000	0.425
3	1	4000	0.417
4	1.5	3000	0.3
5	3.5	6000	0.133

(6 marks)

OR

14b.

(a) Describe the method of calculation of immediate settlement in granular soil by simplified strain influence factor. **(3 marks)**

(b) Explain Skempton-Bjerrum modification for calculation of consolidation settlement.

(3 marks)