

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**FIRST SEMESTER M.TECH DEGREE EXAMINATION (Regular), DECEMBER 2023
GEOMECHANICS AND STRUCTURES****(2021 Scheme)****Course Code: 21GS103****Course Name: Advanced Soil Mechanics****Max. Marks: 60****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. What is the difference between residual and transported soil?
2. State Darcy's law. What are its limitations?
3. Explain any three factors affecting swelling pressure.
4. What is total stress path?
5. What is thixotropy? Explain its significance.
6. 'The permeability of soil decreases with an increase in water content on the dry side of optimum and with increase in compactive effort.' Do you agree? Why?
7. Differentiate between settlements in clayey and granular soil.
8. What is pre-compression?

PART B***(Answer one full question from each module, each question carries 6 marks)*****MODULE I**

9. Explain the two basic structural units of clay mineral with neat figures. (6)

OR

10. Write notes on the structure of
(i) Kaolinite (6)
(ii) Illite

MODULE II

11. Compute the total, effective and pore pressure at a depth of 15 m below the bottom of lake 6 m deep. The bottom of the lake consists of soft clay with a thickness of more than 15 m. The average water content of clay 40% and the specific gravity of soil can be taken as 2.65. (6)

OR

12. a) Comment on discharge velocity and seepage velocity. (2)
b) A foundation trench is to be excavated in a stiff clay strata which is (4)

10 m thick, underlain by a layer of sand. The rise in water level in the trial borehole was found to be 3.5 m below the ground surface. Determine the depth upto which an excavation can be safely carried out without the bottom being unstable. Take G of clay = 2.75 and $e = 0.8$.

MODULE III

13. A clay soil tested in a laboratory showed a decrease in void ratio from 1.20 to 1.10 when the pressure was increased from 100 to 150 kPa. The time required for 90% consolidation was 100 minutes. The clay sample had a thickness of 2.0 cm. Drainage was allowed at the top and bottom. Calculate the coefficient of permeability and the final settlement. (6)

OR

14. a) What do you mean by pre-consolidation pressure? (2)
b) Explain a method to determine the pre-consolidation pressure. (4)

MODULE IV

15. Explain the shear behavior of loose sand, medium sand and dense sand under drained conditions in a direct shear test. (6)

OR

16. A sample failed at a deviator stress of 300 kPa and a confining pressure of 100 kPa. If the confining pressure is increased to 150 kPa, what will be the deviator stress at failure if the soil is (6)
(i) Purely cohesive
(ii) Cohesionless

MODULE V

17. Explain any 3 methods of compaction used in field. (6)

OR

18. Explain anisotropy in undrained shear strength. What is the effect of rate of strain and temperature on the undrained shear strength? (6)

MODULE VI

19. a) Describe the method of calculation of immediate settlement in granular soil using simplified strain influence factor. (3)
b) Explain Skempton-Bjerrum modification for calculation of consolidation settlement. (3)

OR

20. A foundation in plan is 20 m x 2 m with a depth of 2 m. It offers a total pressure of 150 kPa to the soil beneath whose unit weight is 16 kN/m³. The variation in cone penetration resistance recorded below the foundation is as given below. (6)

Layer	Δz (m)	q_c (kPa)	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

Taking $t = 10$ years, calculate the elastic settlement using strain influence factor.
