

Register No: Name:



**SAINTGITS COLLEGE OF ENGINEERING
KOTTAYAM, KERALA**

(AN AUTONOMOUS COLLEGE AFFILIATED TO
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**FIRST SEMESTER M.TECH. DEGREE EXAMINATION(R), MARCH 2021
GEOMECHANICS AND STRUCTURES**

Course Code: 20CEGST105

Course Name: ADVANCED SOIL MECHANICS

Max. Marks: 60

Duration: 3 Hours

PART A

(Answer all questions. Each question carries 3 marks)

1. What is isomorphous substitution?
2. Discuss about limitations of Darcy's law.
3. Differentiate between primary consolidation and secondary consolidation.
4. What is effective stress path?
5. What is thixotropy of soil? Explain its significance.
6. How the temperature affects the undrained shear strength of soil?
7. What is pre-compression?
8. How immediate settlement in a granular soil can be determined?

PART B

*(Answer one full question from each module, each question carries 6 marks,
Assume missing data, if any)*

MODULE I

9. Classify the soils as per Indian Standard System.
 - a) Soil passing 75 micron sieve is more than 95%, LL = 80 % and PL=33 %.
 - b) Soil passing 4.75 mm sieve = 60 %, Retained in 75 micron sieve= 46% . LL = 30%, PI=10%
 - c) Soil passing 4.75 mm sieve= 96% , Retained in 75 micron sieve = 92%. $C_u = 7$ & $C_c = 2.1$. (3X2)

OR

10. What are the basic structural units of clay? Explain about one 2:1 clay mineral. (6)

MODULE II

11. A granular soil deposit has 10.0 m depth, which is lying over a rock layer. Ground water table is 5.0 m below the ground surface. Soil deposit has a capillary rise zone of 2.0 m. Plot the variation of total stress, effective stress and pore pressure. Soil has a specific gravity of 2.72 and voids ratio of 0.78. Soil is saturated up to 90 % in capillary zone. (6)

OR

12. Bring out the difference between quick sand condition and liquefaction of soil. What are the effects? (6)

MODULE III

13. A uniform surcharge of 100 kN/m^2 is applied on the ground surface. The soil strata consist of 2.0 m sand layer at the top followed by 4.0 m clay layer up to hard rock. The ground water table is 2.0 m below the ground level. Determine the initial excess pore water pressure in the clay layer and plot the excess pore pressure diagram in the clay layer for a time factor of 0.5. (6)

OR

14. A clay layer of 4.0 m. thick, sandwiched between two sand layer at top and bottom whose total settlement under a loading is expected to be 40 cm, settles 10 cm at the end of 2nd month after the start of application of load. How many month is required for reaching 90 % settlement? How much settlement will occur in two year? (6)

MODULE IV

15. An undrained triaxial shear test was conducted on clay. Following observations were taken. Find the pore pressure coefficients. Consolidation is done by applying cell pressure from up to 120 kPa. The pore pressure increased from -60 kPa to 30 kPa. After that shearing is done by deviator stress of 440 kPa till failure. Pore pressure recorded at failure is -80 kPa. Find pore pressure parameters. (6)

OR

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

MODULE V

17. What are the effects of compaction on soil? Explain the role of various factors affecting the compaction. (6)

OR

18. Pre-loading is done in which type of soil? Bring out the engineering behavior of soil in pre- loading of soil. (6)

MODULE VI

19. Find the consolidation settlement of a circular water tank of 6.0 m diameter transferring a pressure of 150 kN/m^2 . Clay layer has a thickness of 5.0 m with compression index value of 0.26. Initial void ratio is 1.24. Pore pressure parameter is 0.6. (6)

OR

20. Explain how the stress path is used for calculating the settlement. (6)
