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Reg. No. :

Question Paper Code : 50341

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Fourth/Fifth Semester

Civil Engineering

CE 8491 – SOIL MECHANICS

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define degree of saturation and write its unit.

2. What is meant by Atterberg limit?

3. State Darcy's law.

4. Write any four uses of flownet in engineering problems.

5. What is Newmark's influence chart? Write its principle.

6. Distinguish between immediate and consolidation settlement.

7. Briefly explain about the effect of pore pressure on the shear strength of soil.

8. What are the factors influencing the shear strength of soil?

9. What are the uses of Stability number?

10. What are the different types of slope failure?

PART B — (5 × 13 = 65 marks)

11. (a) What is compaction theory? Explain about the various methods of laboratory and field compaction.

Or

(b) A sample of wet silty day soil has a mass of 126 kg. The following data were obtained from laboratory tests on sample. Wet density. $\rho_t = 2.1 \text{g/cm}^3$, $G = 2.7$, water content, $w = 15\%$. Determine

(i) dry density ρ_d

(ii) porosity,

(iii) void ratio,

(iv) degree of saturation.

12. (a) With neat sketches, describe the field determination of permeability of soil.

Or

(b) The depth of water in a well is 3 m. Below the bottom of the well lies a layer of sand of 5 m thick overlying a clay deposit. The specific gravity of the solids of sand and clay are respectively 2.64 and 2.70. Their water contents are respectively 25% and 20% . Compute the total, effective and pore water pressures at point 6 m from the water table and 2 m below the top surface of the clay.

13. (a) Discuss in brief about the Boussineq's analysis to find vertical stress and horizontal shear stress for point load.

Or

(b) A stratum of normally consolidated clay 7 m thick is located at the depth of 12 m from the ground level. The natural moisture content of the clay is 40.5% and its liquid limit is 48%. The specific gravity of the solid particles is 2.76. The water table is located at a depth of 5 m below the ground surface. The soil is sand above the clay stratum. The submerged unit weight of the sand is 11 kN/m³ and the same weighs 18 kN/m³ above the water table. The average increase in pressure at the center of the clay stratum is 120 kN/m² due to the weight of a building that will be constructed on the sand above the clay stratum. Estimate the expected settlement of the structure.

2   50341

14. (a) Briefly explain about the triaxial tests based on drainage and their applicability. Mention their advantages and disadvantages.

Or

(b) What is the shearing strength of soil along a horizontal plane at a depth of 4 m in a deposit of sand having the following properties:

Angle of internal friction, $\varphi = 35°$

Dry unit weight, $\gamma_d = 17\ \text{kN/m}^3$

Specific gravity, $G_s = 27$.

Assume the ground water table is at a depth of 2.5 m from the ground surface. Also find the change in shear strength when the water table rises to the ground surface.

15. (a) Briefly explain about the various slope protection measures.

Or

(b) Explain about the stability of soil using friction circle method with the neat sketch.

PART C — (1 × 15 = 15 marks)

16. (a) Derive Terzhagi one dimensional consolidation theory and mention its limitations and assumption.

Or

(b) Derive about the Mohr-Coulomb Failure theory and mention its assumption and limitations.

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