

December 2023

**B.Tech.(Civil) V SEMESTER-Re Appear  
Geotechnical Engineering (PCC-CE304/PCC-CE-304)**

Time: 3 Hours

Max. Marks:75

- Instructions:**
1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.
  2. Answer any four questions from Part -B in detail.
  3. Different sub-parts of a question are to be attempted adjacent to each other.

**PART -A**

- Q1 (a) Define void ratio, porosity and water content (1.5)  
 (b) Explain with a neat sketch the three-phase diagram for soil. (1.5)  
 (c) What is the purpose of soil compaction. (1.5)  
 (d) Distinguish between normally consolidated soil and an over consolidated soil. (1.5)  
 (e) What is the difference between discharge velocity and seepage velocity? (1.5)  
 (f) What are the factors affecting permeability? (1.5)  
 (g) List the assumptions of Boussinesq's theory. (1.5)  
 (h) Define pressure bulb. (1.5)  
 (i) What are finite and infinite slopes. (1.5)  
 (j) What are the objectives of soil exploration. (1.5)

**PART -B**

- Q2 (a) Derive from the first principle, the expression  $\gamma_b = ((G+Se) \gamma_w)/(1+e)$ . (5)  
 (b) Explain the sieve analysis method. Explain the significance of a grain size distribution curve with the help of a sketch. (10)
- Q3 (a) State Darcy's law. Define coefficient of permeability of a soil from this law. (5)  
 (b) In a falling head permeability test, the water level in the stand pipe dropped from 40 to 20cm in 1 hour. The diameter of the sample and stand pipe were 8cm and 0.5cm respectively, while the height of the sample was 9.5cm. Determine the coefficient of permeability of soil in m/day. (10)
- Q4 (a) Compute the total, effective and pore pressure at a depth of 20 m below the bottom of a lake 6 m deep. The bottom of lake consists of soft clay with a thickness of more than 20 m. The average water content of the clay is 35% and the specific gravity of the soil may be assumed to be 2.65. (10)  
 (b) Explain the compaction curve. Discuss the factors affecting compaction. (5)
- Q5 (a) What are the assumptions in Terzaghi's one dimensional consolidation theory. (10)  
 (b) What is coefficient of consolidation of soil? How will you evaluate it with square root time method? (5)
- Q6 (a) What are the advantages of triaxial test over direct shear test? (5)  
 (b) Sketch stress strain diagrams for loose sand, dense sand, soft clay and stiff clay and comment. (10)
- Q7 (a) Explain how the vertical pressure determined due to strip load? (5)  
 (b) Derive an expression for vertical stress under circular area using Boussinesq's theory (10)