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Total Number of Pages: 02

IDD (B.Tech and M.Tech)
CIPC2006

4th Semester Regular Examination: 2024-25

SUBJECT: Geotechnical Engineering

BRANCH(S): C&EE, CIVIL, CE

Time: 3 Hours

Max Marks: 100

Q.Code: S436

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Define Darcy's law and state its limitations.
- What is the significance of the Unified Soil Classification System (USCS)?
- Differentiate between total stress and effective stress in soils.
- List two methods for field compaction.
- List two methods to determine the coefficient of permeability in the laboratory.
- What is the purpose of an inverted filter in geotechnical engineering?
- How does capillary action influence soil behavior?
- What is quick sand condition?
- Name the three phases in a soil system.
- What is the role of Mohr's stress circle in shear strength analysis?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Explain the Indian Standard Soil Classification System (ISSCS) with examples.
- Derive the relationship between porosity, void ratio, and degree of saturation.
- Discuss the factors affecting permeability of stratified soil deposits.
- Describe the construction and applications of flow nets in seepage analysis.
- Compare standard Proctor and modified Proctor compaction tests.
- Explain the spring analogy for one-dimensional consolidation.
- Discuss the shear characteristics of cohesive soils versus cohesionless soils.
- How does the triaxial compression test determine shear strength parameters?
- Describe the unconfined compression test procedure and result interpretation.
- Derive Laplace's equation for two-dimensional seepage flow.
- Explain the process of mechanical stabilization of soils.
- Discuss the role of clay mineralogy in soil structure formation.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

(16 x 2)

- Q3** Derive and discuss the equations involved in Terzaghi's one-dimensional consolidation theory and explain the consolidation process with graphs. **(16)**
- Q4** A clay layer is 4 m thick and drained on one side. If the coefficient of consolidation is $0.001 \text{ cm}^2/\text{sec}$, calculate the time required for 50% consolidation. Discuss how this is interpreted in field conditions. **(16)**
- Q5** A soil sample is tested for compaction. Analyze the results of standard and modified Proctor tests, plot the graphs and discuss optimum moisture content and maximum dry density determination. **(16)**
- Q6** A soil sample has the following properties: Natural water content = 22 %, Specific gravity = 2.65, Bulk density = 18.5 kN/m^3 . Calculate void ratio, porosity, degree of saturation, and dry density. **(16)**