Registration No.: | | | | | | | | | | |

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)**

a) Define Darcy's law and state its limitations.
b) What is the significance of the Unified Soil Classification System (USCS)?
c) Differentiate between total stress and effective stress in soils.
d) List two methods for field compaction.
e) List two methods to determine the coefficient of permeability in the laboratory.
f) What is the purpose of an inverted filter in geotechnical engineering?
g) How does capillary action influence soil behavior?
h) What is quick sand condition?
i) Name the three phases in a soil system.
j) 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)**

a) Explain the Indian Standard Soil Classification System (ISSCS) with examples.
b) Derive the relationship between porosity, void ratio, and degree of saturation.
c) Discuss the factors affecting permeability of stratified soil deposits.
d) Describe the construction and applications of flow nets in seepage analysis.
e) Compare standard Proctor and modified Proctor compaction tests.
f) Explain the spring analogy for one-dimensional consolidation.
g) Discuss the shear characteristics of cohesive soils versus cohesionless soils.
h) How does the triaxial compression test determine shear strength parameters?
i) Describe the unconfined compression test procedure and result interpretation.
j) Derive Laplace's equation for two-dimensional seepage flow.
k) Explain the process of mechanical stabilization of soils.
l) 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 cm^2/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)**