

Roll No.

Total Pages : 3

002404

May 2024

B.Tech. (Civil / ENV) - IV SEMESTER

Soil Mechanics (PCC-CED-207)

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

1. (a) Define the terms mass specific gravity, dry density and void ratio. (1.5)
- (b) List the various methods for determining water content in a laboratory. (1.5)
- (c) Explain with a neat sketch the three-phase diagram for soil. (1.5)
- (d) What is a flow net? Describe its properties. (1.5)
- (e) State the various corrections required for a hydrometer reading. (1.5)
- (f) What are the main index properties of a fine-grained soil? (1.5)

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3.2 [P.T.O.]

- (g) Find the value of C_c and C_u for given data - $D_{60} = 1.55$ mm, $D_{30} = 0.53$ mm, and $D_{10} = 0.115$ mm. (1.5)
- (h) Define total stress, neutral stress and effective stress. (1.5)
- (i) List the assumptions of Boussinesq's theory. (1.5)
- (j) What are the factor affecting compaction of soil? (1.5)

PART-B

2. (a) In a constant head permeability tests, the following observations were taken. Distance between piezometer tapping's = 100 mm, Difference of water levels in piezometers = 60 mm, Diameter of the test sample = 100 mm, Quantity of water collected = 350 ml, duration of the test = 270 seconds. Determine the coefficient of permeability of the soil. (10)
- (b) What is Darcy's law? What are its limitations? (5)
3. (a) Define the following terms :
- Coefficient of compressibility.
 - Coefficient of volume change.
 - Compression index.
 - Recompression index.
 - Expansion index. (5)
- (b) What is triaxial (UU, CU and CC) tests? Sketch the apparatus used. What is its advantage over a direct shear test? (10)

4. Provide the expression for Terzaghi's one-dimensional consolidation theory along with its assumptions. (15)
5. (a) Differentiate between general shear failure and the local shear failure. (5)
- (b) Derive an expression for vertical stress under circular area using Boussinesq's theory. (10)
6. (a) Describe Culmann's method for the stability analysis of slopes. What are its limitations? (10)
- (b) Determine the ultimate bearing capacity of a strip footing, 1.20 m wide, and having the depth of foundation of 1.0 m. Use Terzaghi's theory and assume general shear failure. Take $N_c = 57.8$, $N_q = 41.4$, $N_\gamma = 42.4$, $\gamma = 18$ kN/m³, and $c = 15$ kN/m². (5)
7. What are the assumptions made in the derivation of Terzaghi's bearing capacity theory? Drive the equation for the ultimate bearing capacity. (15)