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)

(g) Find the value of Cc and Cu 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, neural 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 :

(i) Coefficient of compressibility.

(ii) Coefficient of volume change.

(iii) Compression index.

(iv) Recompression index.

(v) 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 Nc = 57.8, Nq = 41.4, $N\gamma$ = 42.4, γ = 18 kN/m^3, and c = 15 kN/m^2. (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)