Code No: 155BN **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, January - 2025
GEOTECHNICAL ENGINEERING
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Define consistency of clay and write its importance.	[2]
b)	Write the upper and lower limits of size of gravel, sand, silt and clay particles.	[3]
c)	State the significance of Darcy's law.	[2]
d)	Derive the expression for capillary rise in soil.	[3]
e)	Write about zero air void line.	[2]
f)	What is pressure bulb? Write its significance.	[3]
g)	Define degree of consolidation.	[2]
h)	What is compression index? Write its usefulness.	[3]
i)	Write about pore pressure parameters B and its importance.	[2]
j)	Write about Mohr's-Coulomb' theory.	[3]

PART – B

(50 Marks)

2.a) Explain two phase and three phase diagrams and derive from definitions: es = Gw.
b) A saturated clay has specific gravity 2.7 and dry unit weight 16 kN/m^3. If water content of the clay is 40%, estimate its void ratio, porosity and bulk unit weight. [4+6]

OR

3.a) Define the following: liquidity index, consistency index, flow index and toughness index.
b) Explain the importance of soil classification and also elaborate on plasticity chart. [4+6]

4.a) State Darcy's Law and mention its limitations.
b) On a certain site, there are three horizontal soil layers, down to an impermeable rock bed, the details of which are as follows: Layer A: Thickness = 3.50 m; k = 2.50×10^{-5} m/s; Layer B: thickness = 1.80 m; k = 140×10^{-7} m/s; Layer C: thickness = 4.20 m; k = 5.60×10^{-3} m/s. Estimate for the average horizontal and vertical permeability of the soil. [4+6]

OR

5.a) What are factors affecting permeability of soil? Discuss.
b) Explain what is quicksand condition? Derive equation for critical hydraulic gradient. [4+6]

6.a) Discuss about specifications of standard and modified Proctor's compaction test.
b) In a standard proctor test the mould of 1000 cm^3 capacity weighs 12.5 N when empty. successive trials gave the following results. Determine maximum dry density and Optimum water content. [4+6]

OR

7.a) Discuss the variation of vertical stress along the vertical plane due to a Boussinesq's point load.

b) A raft of size 4m×4m carries a load of 120 kPa. Determine the vertical stress increment at a point 5 m below the centre of the loaded area using Boussinesq's theory. Use the equivalent point load method. [4+6]

8. Discuss the reasons of preconsolidation of soil? Explain Casagrande's graphical method for determining the preconsolidation pressure. [10]

OR

9.a) Explain the primary consolidation settlement.

b) Describe estimation of coefficient of consolidation from square root time method. [4+6]

10.a) On which type of soil unconfined compressive stress test is conducted and explain the test?

b) Unconfined compressive strength of soil is found to be 150 kPa. A sample of the same soil failed at a deviator stress of 200 kPa. Determine shear strength parameters of the soil. [4+6]

OR

11.a) Discuss the following: UU test, CU test and CD test.

b) Discuss the merits of triaxial compression stress test over direct shear test. [4+6]

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