

Code No: 155BN

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: $e_s = G_w$.
- 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]

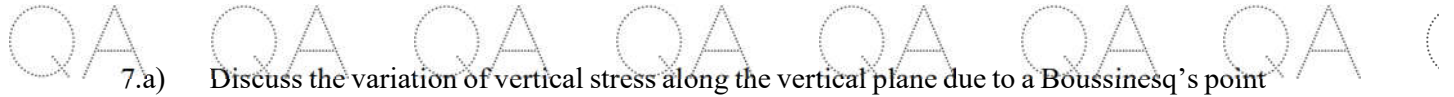
- 4.a) State Darcy's Law and mention its limitations.
- b) On a certain site, there are three horizontal soil layers, down to an impermeable rock bed, the details of which are as follows: Layer A: Thickness = 3.50 m; $k = 2.50 \times 10^{-5} \text{ m/s}$; Layer B: thickness = 1.80 m; $k = 140 \times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

OR

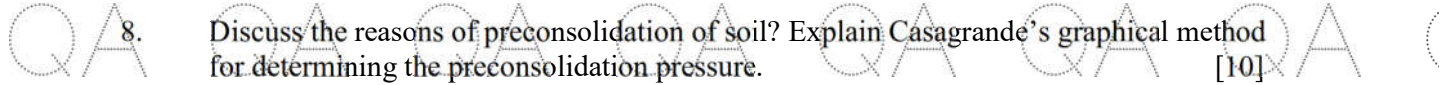
- 5.a) What are factors affecting permeability of soil? Discuss.
- b) Explain what is quicksand condition? Derive equation for critical hydraulic gradient. [4+6]

- 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



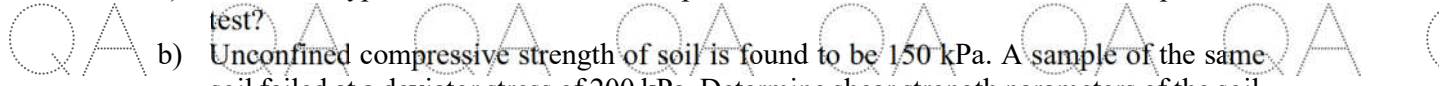
- 7.a) Discuss the variation of vertical stress along the vertical plane due to a Boussinesq's point load.
- b) A raft of size $4\text{m} \times 4\text{m}$ carries a load of 120 kPa . Determine the vertical stress increment at a point 5 m below the centre of the loaded area using Boussinesq's theory. 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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