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Code No: 155BN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, July/August - 2023

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 water content and degree of saturation.	[2]
b)	How do you conduct calcium carbide method of water content determination?	[3]
c)	What do you understand by boiling condition?	[2]
d)	What is Darcy's law? What are its Limitations?	[3]
e)	Why compaction curve is not suitable to pure sands? Comment your answer.	[2]
f)	How to construct the pressure bulb diagram and what are its use?	[3]
g)	Write about stress history of clay using e-σ curves.	[2]
h)	How do you determine the pre-consolidated pressure?	[3]
i)	What do you mean by shear strength?	[2]
j)	What do you understand by critical void ratio?	[3]

PART - B

(50 Marks)

2.a) From fundamentals derive es=Gw.

b) A sandy soil has a saturated density of 2.08 g/cc. When it is allowed to drain the density is reduced to 1.84 g/cc and the volume remains constant. If the grain specific gravity is 2.70, what will be the quantity of water that will drain from a layer of the sand 2.2 m thick in litres/m^2? [5+5]

OR

3.a) Write short note on textural classification.

b) Explain briefly about particle size distribution, and its importance. [4+6]

4.a) Explain factors affecting permeability of soil.

b) The results of a constant-head permeability test for a fine sand sample having a diameter of 150 mm and a length of 300 mm are as follows:
Constant head difference = 500 mm
Time of collection of water = 5 min
volume of water collected = 350 cm^3
Assume that the same soil is kept for the variable head test, what should be the area of stand pipe for the drop of head from 250 mm to 120 mm in 8 min. [4+6]

OR

5.a) What is the concept of effective stress? Discuss the following: effective stress, pore water pressure and total stress in a soil.

b) For a sheet pile wall constructed in a soil having effective grain size is 0.1 mm, the difference of the upstream and downstream water levels is 3 m. The flow net is drawn for the problem yields 2 as the ratio of number of head drops to number of flow channels. Determine the discharge per m length of sheet pile wall. [5+5]

6.a) Discuss about Newmark's influence chart for irregular areas with a neat sketch.

b) The four legs of a transmission tower form in plan a square of side 4m and together carry a total load of 200kN. Compute the increase in vertical stress at a depth of 3m vertically below a Leg. Use Boussinesq's theory. [5+5]

OR

7.a) Explain in brief the various factors that influence the compaction of soils, show their influence with illustrative sketches of compaction curves.

b) Explain why soils are compacted in the field? Discuss how the degree of compaction or relative compaction is ensured in the field? [5+5]

8. A layer of compressible clay of 4m thick is lying with pervious sand at top and impervious rock at the bottom. In a standard consolidation test on an undisturbed specimen of clay from this deposit, 90% settlement reached in 4 hours under 2.0 kg/cm^2. The specimen was 20mm thick. Estimate the time in years for the building (which induces a pressure of 20t/m^2) founded over this deposit to reach 90% of its final settlement. [10]

OR

9.a) Explain Taylor's square root of time fitting method to determine coefficient of consolidation.

b) In a consolidation test done in a laboratory a sample of 20 mm thick consolidated 50% in 15 minutes with double drainage. How much time a 5 m thick layer of same soil will consolidate 50% and 30%? If the layer has a rock below, how much time it will take to consolidate 50% and 30%? [5+5]

10.a) Explain merits and demerits of laboratory direct shear test to determine the shear strength of soil.

b) In an in-situ vane shear test on a saturated clay, a torque of 35 Nm was required to shear the soil. The diameter of the vane was 50 mm and length 100 mm. Calculate the undrained shear strength of the clay. The vane was then rotated rapidly to cause re-moulding of the soil. The torque required to shear the soil in the re-moulded state was 5 Nm. Determine the sensitivity of the clay. [5+5]

OR

11.a) An embankment consists of clay fill for which cohesion is 25 kPa and angle of internal friction is 27^0 (from consolidated undrained tests with pore-pressure measurement). The average bulk unit-weight of the fill is 20 kN/m^3. Estimate the shear-strength of the material on a horizontal plane at a point 20 m below the surface of the embankment, if the pore pressure at this point is 180 kPa as shown by a piezometer.

b) Explain stress-strain behaviour of loose and dense soils. [6+4]

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