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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, February - 2022
GEOTECHNICAL ENGINEERING
(Civil Engineering)

Time: 3 hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
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1.a) Discuss the following: i) Water content ii) Air content iii) Degree of saturation iv) Specific gravity.

 b) A sheet of water thickness 1 m is available to fill the voids of cohesionless soil to a degree of saturation of 80%. The soil has a void ratio of 0.5. Determine the thickness of soil layer required to accommodate this amount of water.   [7+8]

2.a) Explain the laboratory procedure for determining the specific gravity of soil solids.

 b) A 100cc clay sample has natural water content of 30%, it's shrinkage limit is 18%. If the specific gravity of solids is 2.72, what will be the volume of the sample at a water content of 15%?   [7+8]

3. A non-homogeneous soil deposit consists of a silt layer sandwiched between a fine sand layer at top and a clay layer below. Permeability of silt layer is 10 times the permeability of clay layer and one-tenth of the permeability of the sand layer. Thickness of silt layer is 2 times the thickness of the sand layer and two-third of the thickness of the clay layer. Determine the ratio of equivalent horizontal and equivalent vertical permeability of the deposit.   [15]

4. A uniform homogeneous sand deposit of specific gravity 2.60 and void ratio 0.65 extends to a large depth. The ground water table is 2 m from ground level. Determine the effective, neutral, and total stress at depths of 2 m and 6 m. Assume that the soil from 1 m to 2 m has capillary moisture leading to degree of saturation of 100%.   [15]

5.a) Discuss about variation of vertical stress under point load along the vertical and horizontal plane.

 b) Define compaction in soil mass. Draw the compaction curve and show its salient features. Explain the factors affecting compaction of soil sample.   [7+8]

6.a) Discuss the following:
    i) Degree of compaction ii) Zero air void line   iii) Compaction effort.

 b) Explain the differences in Boussinesq's theory and Westergaard's theory of vertical stress.   [7+8]

7.a) The void ratio of a clay soil is 1.64 and its compression index is 0.25 at the pressure 120kN/m². Determine the void ratio if the pressure is increased to 190kN/m².

 b) Discuss the following: i) Under consolidated soil ii) Normally consolidated soil and iii) over consolidated soil.   [7+8]

8. 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 remoulding of the soil. The torque required to shear the soil in the remoulded state was 5 Nm. Determine the sensitivity of the clay.   [15]

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