Code No: 115EQ

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, November/December - 2016
GEOTECHNICAL ENGINEERING
(Common to CE, CEE)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) Define the terms (i) Degree of saturation (ii) air content (iii) relative density. [2]
b) List the common clay minerals and summarize their key properties . [3]
c) State Darcy's law. Explain the validity of Darcy's law. [2]
d) Describe the quick sand condition. [3]
e) Explain stress distribution in soils for concentrated loads by Boussinesq theory. [2]
f) Differentiate between (i) Standard Proctor test (ii) Modified Proctor test [3]
g) Define the terms 'Normally consolidated soils', coefficient of volume change', and 'coefficient of compressibility', [2]
h) What is the pre-consolidation pressure? [3]
i) Discuss the characteristics of Mohr's circle. [2]
j) Explain the classification of shear tests based on drainage conditions. [3]

PART - B

(50 Marks)

2.a) Explain the soil formation and soil types.
b) Explain the terms porosity, void ratio and degree of saturation 1 m^3 of wet soil weighs 20 kN. Its dry weight is 18 kN. Specific gravity of solids is 2.67. Determine the water content, porosity, void ratio and the degree of saturation. Draw a phase diagram. [5+5]

OR

3.a) An undisturbed saturated specimen of clay has a volume of 18.9 cm^3 and a mass of 30.2 g. on oven drying, the mass reduces to 18.0 g. the volume of dry specimen as determined by displacement of mercury is 9.9 cm^3. Determine shrinkage limit, specific gravity, shrinkage ratio and volumetric shrinkage.
b) Explain sensitivity, thixotropy and activity. The insitu void ratio of a granular soil deposit is 0.50. the maximum and minimum void ratios of the soil were determined to be 0.75 and 0.35. Gs= 2.67. Determine the relative density of the deposit. [5+5]

4.a) Explain Capillarity in soils. Calculate the approximate height of capillary rise in a soil having e = 0.75, D_{10} = 0.05 mm (assume C =25). What is the value of capillary tension?
b) A 5 m thick sand layer (Gs = 2.67, e = 0.6) is underlain by a bed of 4 m clay (γsat= 20 kN/m^3), plot the total, neutral and effective stress distribution upto the bottom of the clay layer, when (i) the water table is at 2 m below ground surface,(take, S= 50% above the water table) (ii) the water table is at the ground surface. (iii) the water table is 2 m above the ground surface. [5+5]

OR

5.a) What are the factors affecting permeability? A horizontal stratified deposit consists of three layers each uniform in itself. The permeability of the layers are 8×10^{-6} m/s, 50×10^{-6} m/s and 15×10^{-4} m/s and there thicknesses are 6 m, 3m and 18m respectively. Find effective average permeability of the deposit in horizontal and vertical direction.

b) Explain quick sand condition. Give the characteristics of Flow nets. [5+5]

6.a) A strip footing 3 m wide is loaded on the ground surface with a pressure at 100 kN/m^2. A 4m thick soft clay layer exits at a depth of 10 m below the foundation. Find the average increase in vertical stress at the clay layer under the centre line and edge of the building.

b) Explain Newmark's chart for finding vertical stresses. [5+5]

OR

7.a) During a compaction test, a soil attains MDD of 18.6 kN/m^3 at a moisture content of 15%. Taking specific gravity of soils as 2.7, find the degree of saturation and percentage air voids at MDD. What will be the dry density corresponding to zero air voids at OMC. How does compaction improve the engineering properties of soils?

b) An elevated structure with a total weight of 10,000 kN is supported on a tower with 4 legs. The legs rest on piers located at the corners of a square 6 m on a side. What is the vertical stress increment due to this loading at a point 7 m beneath the centre of the structure? Explain Westergaard's Equation. [5+5]

8.a) A 8 m thick clay layer with single drainage settles by 120 mm in 2 years. The coefficient of consolidation for this clay was found to be 6×10^{-3} cm^2/s. Calculate the likely ultimate consolidation settlement and find out how long it will take to undergo 90% of the settlement.

b) Explain Terzaghi's 1-D consolidation theory. [5+5]

OR

9.a) A clay soil, tested in a consolidometer, showed a decrease in void ratio from 1.20 to 1.10 when the pressure was increased from 0.25 to 0.50 kgf/cm^2. Calculate the coefficient of compressibility and the coefficient of volume compressibility. If the coefficient of consolidation determined in the test for the given stress increment was 10 m^2/ year, calculate the coefficient of permeability in cm/s. If the samples tested at the site was taken from a clay layer 3 m in thickness, determine the consolidation settlement resulting from the given stress increment.

b) Explain height of solids and change in void ratio method for computing equilibrium void ratio. [5+5]

10.a) Explain the stress-strain and volume change behaviour of sands.

b) Triaxial test carried out on a partially saturated clay gave c' = 20kN/m^2 and $\phi' = 22^0$. If the pore pressure parameters for the clay A and B were 0.45 and 0.8 respectively, calculate the pore pressures in a specimen of clay at the beginning and end of each of the two stages of one of the test. (i) Consolidation stage when the cell pressure was 150 kN/m^2 (ii) shear stage with a cell pressure raised to 300 kN/m^2. [5+5]

OR

11.a) In an insitu 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

b) Explain direct shear test and unconfined compression test. [5+5]

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