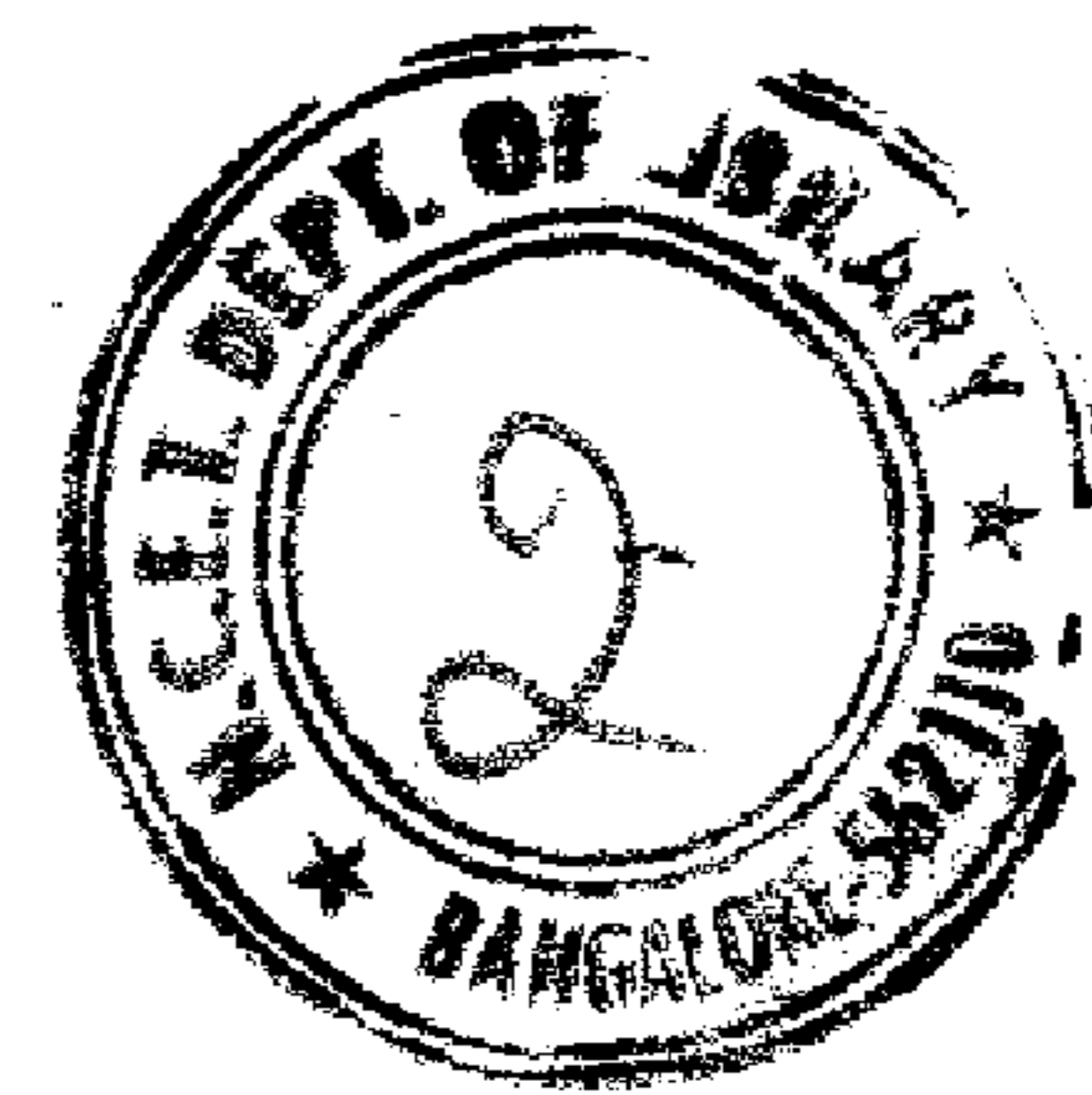


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06CV54

Fifth Semester B.E. Degree Examination, June-July 2009
Geotechnical Engineering

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting at least TWO questions from each part.
2. Assume relevant data where required.

PART - A

- 1
 - a. Define the terms Bulk Density, dry density, degree of saturation and water content with the help of a phase diagram. (08 Marks)
 - b. With usual notations obtain the expression for Bulk density in the form $\gamma_b = \left[\frac{G + pe}{1 + e} \right] r_w$ (06 Marks)
 - c. In an earthen embankment under construction the bulk unit weight is 16.5 kN/m^3 at a water content of 11%. The water content is to be raised to 15%. Compute the quantity of water required to be added per cubic metre of soil? Assume no change in the void ratio. (06 Marks)

- 2
 - a. With the help of particle size distribution curve, explain the terms (i) Well graded (ii) Poorly graded (iii) Uniformly graded (iv) Gap graded distributions. (08 Marks)
 - b. Briefly explain the correction to be applied to a hydrometer reading. (06 Marks)
 - c. An undisturbed saturated specimen of clay has a volume of $18.9 \times 10^3 \text{ mm}^3$ and mass of 0.302N. On oven drying, the mass reduced to 0.18 N. The volume of dry specimen as determined by displacement of mercury is $9.9 \times 10^3 \text{ mm}^3$. Determine shrinkage limit, specific gravity shrinkage ratio. (06 Marks)

- 3
 - a. Explain soil classification according to IS classification system. (08 Marks)
 - b. Mention three different clay minerals commonly found in soils. Explain their structure with sketches. (06 Marks)
 - c. What are the different types of structures that the soil particles form during and after deposition in fresh water? Discuss their characteristics. (06 Marks)

- 4
 - a. Briefly explain variable head permeameter test and also derive the expression used to find the coefficient of permeability. (08 Marks)
 - b. Discuss the factors affecting the permeability of soil. (06 Marks)
 - c. A clay structure of thickness 8m is located at a depth of 6 m below the ground surface, it is overlaid by fine sand, the water table is located at a depth of 2 m below ground surface. For fine sand submerged unit weight is 10.2 kN/m^3 . The moist unit weight of sand located above the water table is 16 kN/m^3 . For clay layer, $G = 2.76$ and water content is 25%. Compute the effective stress at the middle of clay layer. (06 Marks)

PART – B

- 5 a. Discuss the effect of compaction on soil properties. (08 Marks)
b. Explain Vibro floatation technique for insitu densification of soils. (06 Marks)
c. Calculate compaction energy used in Staudar Proctor test and modified Proctor test. (06 Marks)
- 6 a. Distinguish between normally consolidated and over consolidated soils. (06 Marks)
b. How preconsolidation pressure is determined by Casagraude's method? (06 Marks)
c. A soil sample 20mm thick takes 20 minutes to reach 20 percent consolidation. Find the time taken for a clay layer 6 m thick to reach 40% consolidation. Assume double drainage in both cases. (08 Marks)
- 7 a. What is Mohr's strength theory for soils? Sketch typical strength envelopes for a soft clay, a clean sand and a silty clay. (08 Marks)
b. Distinguish between Total shear strength parameters and Effective shear strength parameters. (06 Marks)
c. Explain (i) Sensitivity (ii) Thixotropy (06 Marks)
- 8 a. Explain the square root of time fitting method of determining the coefficient of consolidation of a clay sample. (08 Marks)
b. How are shear tests classified based on drainage conditions? Under what conditions, each one of these tests is preferred? (06 Marks)
c. In a vane shear test conducted in a soft-clay deposit, failure occurred at a Torque of 42N-m. Afterwards the vane was allowed to rotate rapidly and test was repeated in the remoulded soil. The Torque at failure in the remoulded soil was 17Nm. Calculate the sensitivity of soil. In both cases the vane was pushed completely inside soil. The height of vane and diameters across blades were 100mm and 80mm respectively. (06 Marks)
