15095

B. Tech 4th Semester Examination

Soil Mechanics (OS)

CE-4004

Time : 3 Hours   **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : (i)   Attempt ONE question from each section A, B, C & D.

(ii) Section-E is compulsory.

(iii) The questions are of equal value.

(iv) Missing data, if any, may be assumed suitably.

SECTION - A

1. (i)   How do you use field identification tests to identify the major soil types?   (10)

    (ii) Following data are given: Sample size 3.81 cm dia. X7.62 cm height; wet weight =1.668 N; Oven dried Weight =1.4 N; Specific gravity=2.7. Determine its water content, Dry density, Bulk density, Void ratio and Degree of saturation.   (10)

2. (i)   Draw the plasticity chart incorporated in IS: 1498 (1970) and explain its use for classifying fine grained soils.
                                                       (10)

    (ii) The dry unit weights of sand in the loosest and densest states are respectively 13.6 and 21.8kN/m^3, specific gravity of solids is 2.67. Determine the relative density of sand if its porosity is 30%.   (10)

[P.T.O.]

SECTION - B

3. (i)   Prove that the permeability of a soil deposit in a direction parallel to the bedding plane is more than the perpendicular to it.   (10)

    (ii) Old records of a soil compacted in the past give water content of 15% and saturation of 85%. What might be the dry density of the soil?   (10)

4. (i)   What types of soil are best compacted by the use of the following compaction equipments?

    (a) Smooth wheeled rollers.

    (b) Pneumatic tyred rollers.

    (c) Sheeps foot rollers.

    (d) vibratory rollers.   (10)

    (ii) Estimate the coefficient of permeability K_2 of a sandy soil at a void ratio e_2 of 0.75 when the same soil has a permeability K_1 of 2.0×10^{-2} cm/sec at a void ratio e_1 of 0.64.   (10)

SECTION - C

5. (i)   Compare and contrast the Bossinesque's and Westergaard's equations for stress distribution in soils for a concentrated load at the surface.   (10)

    (ii) In a consolidation test the void ratio of soil sample decreases from 1.20 to 1.10 when the pressure is increased from 200 kN/m^2 to 400 kN/m^2. Calculate the coefficient of consolidation if the coefficient of permeability is 8.0×10^{-7} mm/sec.   (10)

6. (i) Define the terms:

   (a) Compression index

   (b) Coefficient of volume decrease

   (c) Coefficient of consolidation and

   (d) Degree of consolidation.   (10)

   (ii) A water tower is supported only on three pillars forming an equilateral triangle with 10m sides. The total weight of the tower is 120 tonnes. Calculate the vertical stress 10 m below the ground level under one of the legs.
                                                    (10)

SECTION - D

7. (i) Define 'shear strength' of a soil. Is it possible to tabulate the values of shear strength for different soils?   (10)

   (ii) Excavation was being carried out for a foundation trench in a plastic clay having unit weight of 23kN/m^3. When the depth of excavation reached 8m it failed. On assumption that $\phi = 0°$, calculate the value of cohesion of clay.
                                                    (10)

8. (i) What is earth pressure at rest? When is it likely to develop behind a retaining wall? Derive an expression for the coefficient of earth pressure at rest condition.   (10)

   (ii) A vane 10.8 cm long and 7.2 cm in diameter was pressed into soft clay at the bottom of the bore hole. Torque was applied and the value at failure is 45Nm. Find the shear strength of clay on a horizontal plane.   (10)

[P.T.O.]

SECTION - E

9. Define the following terms:

   (i) Residual soils.

   (ii) Dry density.

   (iii) Coefficient of Uniformity.

   (iv) Plasticity index.

   (v) Seepage velocity.

   (vi) Exit gradient.

   (vii) Piping.

   (viii) Angle of repose.

   (ix) Sensitivity.

   (x) Active earth pressure.   (10×2=20)