

B.E. (CE) Part-III 5th Semester Examination, 2009

Soil Mechanics-I

(CE-502)

Time : 3 hours

Full Marks : 70

Use separate answerscript for each half.**FIRST HALF**(Answer Q.No.1 and any TWO from the rest.)

1. Write short notes on any five of the following : [5×3]
 - a) Void ratio and porosity,
 - b) Dry density and bulk densities of soils,
 - c) Uniformity coefficient and coefficient of curvature,
 - d) Activity and sensitivity of soils,
 - e) Flow index and Toughness index,
 - f) Shrinkage Ratio and degree so shrinkage,
 - g) Plasticity chart.

2. Develop an expression for capillary rise of water in soil. The soil at the toe of a dam is fully saturated and has water content of 40% and the specific gravity of the soil solids of 2.66. For safety measure, against piping, the exit gradient is restricted to 30% of the critical hydraulic gradient. Calculate the permissible exit gradient. Explain the terms – effective stress, neutral stress and total stress in soil. [3+4+3]

3. State Darcy's law for flow of water through pervious soil. State the factors effecting the value of coefficient of permeability of soils. Name the methods of determining the coefficient of permeability. If h_1 , h_2 and h_3 are heads in a falling head permeameter at start, 't' secs and '2t' secs after start respectively, derive a relation between them. [2+5+1+2]

4.
 - a) Dry unit weight of a sand in its loosest and densest states are 1.36 and 2.18 g/cc respectively. Assuming the specific gravity of soil solids as 2.69, determine the relative density of the sand when porosity is 30%.
 - b) The bulk density and moisture content of saturated clay sample are 1.97 g/cc and 30% respectively. On oven drying the density drops to 1.60 g/cc. Calculate the specific gravity of clay particles and the shrinkage limit. [5+5]

SECOND HALF

(Answer Q.No.5 and any TWO from the rest.)

5. Write short notes on any three : [3×5]
- Methods of evaluating preconsolidation pressure,
 - Newmark's influence chart,
 - Advantages of triaxial compression tests,
 - Mohr's circle of stresses and Mohr-Coulomb strength envelope,
 - Coefficient of compressibility and coefficient of volume change.
6. What are the assumptions of Boussinesq's stress analysis for a point load at ground surface? A circular footing has to transfer a load of 15 t on the horizontal ground surface. The depth of the footing is 60 cm. Evaluate the vertical stress increment at a point located 5 m below the base of the footing, using, (a) uniformly distribution of load over the base area of footing, (b) the load is concentrated at the centre of footing. [10]
7. Classify cohesive soil based on unconfined compressive strength. In an UC test on an undistributed soil sample 38 mm diameter and 76 mm long. The load at failure was 20 N. The axial deformation of the sample at failure was 10 mm. Determine undrained shear strength parameter of the soil if the failure plane makes an angle of 50° with the horizontal. [10]
8. State the assumptions of Terzaghi's one dimensional consolidation theory. A soil sample of 20 mm thickness takes 20 minutes to attain 20% consolidation. The sample was collected from a homogeneous clay stratum of 6 m thickness. Find the time required for the clay stratum to attain 40% consolidation. Assume double drainage in both laboratory and field. [10]