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Paper Code : CE(PC)401 Soil Mechanics - I

UPID : 004445

Time Allotted : 3 Hours

Full Marks :70

The Figures in the margin Indicate full marks.
Candidate are required to give their answers in their own words as for as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :   [1 x 10 = 10]

   (I) The apparatus that is suitable for conducting drained, undrained and consolidated drained shear test is _____

   (II) The maximum size of grains of clay is about _____

   (III) Water present in the voids of soil mass is called _____

   (IV) The coefficient of permeability of clay is not more than_____

   (V) Seepage force is the energy transfer between _____ and _____

   (VI) The stresses due to self-weight of the soil are known as _____

   (VII) The maximum water content of a saturated soil at which a reduction in moisture does not cause a decrease in volume of the soil is called _____

   (VIII) The Critical Hydraulic Gradient observed for sand boiling condition is given by _____

   (IX) The average velocity of flow that will take place through the total cross-sectional area of soil under unit hydraulic gradient is known as _____

   (X) The relationship between the seepage pressure (p_s) and hydraulic head (h) is given by _____

   (XI) A soil is said to be well graded if coefficient of curvature lies between _____

   (XII) The surface tension of water (TS) in dyne/cm unit is _____

Group-B (Short Answer Type Question)

Answer any three of the following :   [5 x 3 = 15]

2. What is meant by capillary rise in soil? How does it affect the pre-water pressure?   [5]

3. A sample of coarse sand 15 cm high and 5.5 cm in diameter was tested in a constant head permeameter. Water permeated through the soil under a hydrostatic head of 50 cm for 5 sec. The water was collected and was found to weigh 500 gm. Find the permeability of soil in cm/sec.   [5]

4. Calculate the stress in a soil mass 6 m below the centre of a uniformly loaded circular area of radius 1.5 m with a pressure of 60 kN/m^2 and thus obtain the exact depth at which the stress reduced to 15% of the applied load.   [5]

5. A cohesive soil has an angle of shearing resistance of 15 degree and cohesion of 35 KN/sq.m. If a specimen of this soil is subjected to a triaxial compression test then find lateral pressure in the cell for failure to occur at a total axial stress of 300 KN/ sq.m.   [5]

6. To find the coefficient of permeability of clay, the permeability test was carried out in a variable head permeameter having diameter of the sample container to be 10 cm. The initial head of water in the stand pipe was 45 cm and observed to drop to 30 cm in 3.25 minutes. If the sample is 15 cm high and diameter of the stand pipe is 1.9 cm, then find the coefficient of permeability of clay in meter per day.   [5]

Group-C (Long Answer Type Question)

Answer any three of the following :   [15 x 3 = 45]

7. (a) Write a short note on Equivalent Point Load Method.   [7]

   (b) Write a short note on 2:1 Method.   [8]

8. A sandy soil deposit of 4 m depth has following properties: Specific gravity is 2·65 and void ratio is 0·6. The ground water table is at a depth of 2 m. Calculate total stress and effective stress and pre. water pressure at 1 m, 2 m and 4 m depths and draw their distribution up to 4 m depth.   [15]

9. (a) What are the different methods for construction of flow net?   [3]

(b) Briefly describe about graphical method for construction of flow net. [12]

10. (a) An oven dry soil sample of volume 250 cc weighs 430 gm. If the specific gravity of solids is 2.7, what is the water content when the soil becomes fully saturated without any change in volume? What will be the water content which will fully saturate the sample and also cause an increase in volume equal to 10% of the original dry volume? [8]

(b) A 1000 cc core cutter weighing 946.8 gm was used to find out the in-situ unit weight of an embankment. The weight of core cutter filled with soil was 2770.6 gm, laboratory tests on the sample indicated a water content of 10.45% specific gravity of 2.65. Find the bulk unit weight, void ratio and degree of saturation of the sample. If the embankment becomes saturated due to rains then find the water content and saturated unit weight assuming no volume change in sample on saturation. [7]

11. A sand deposit of 5 m deep located over a clay deposit of 4 m deep. The ground water table is at 3 m below the ground surface. Draw the total, neutral and effective stress diagram up to a depth of 9 m. Neglecting capillary rise. Properties of sand: void ratio e = 0·5, s = 40 %, G = 2·67. Properties of clay: natural moisture content, Wn = 40%, G = 2·7. [15]

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