PVP 12

Code: CE4T2

II B.Tech - II Semester – Regular Examinations - JUNE 2014

GEOTECHNICAL ENGINEERING - I
(CIVIL ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Discuss the following: 6 M
   (i) Kaolinite Clay
   (ii) Void ratio
   (iii) Submerged unit weight of soil

   b) The mass of a moist soil sample collected from field is 465 grams and its oven dry mass is 405.76 grams. The specific gravity of the soil solids was determined in the laboratory to be 2.68. If the void ratio of the soil in the natural state is 0.83, find the following: 8 M
   (i) The moist density of the soil in the field (Kg/m^3)
   (ii) The dry density of the soil in the field (Kg/m^3).
   (iii) The mass of water in kilograms to be added per cubic meter of soil in the field for saturation.

2. a) Define Liquidity index, Shrinkage limit and uniformity coefficient. 6 M

b) The consistency limits of a soil sample are: Liquid limit 52%, plastic limit 32% shrinkage limit 17 %. If the specimen of the soil shrinks from a volume of 10 cm^3 at liquid limit to 6.01 cm^3 at the shrinkage limit, find the specific gravity of solids. 8 M

3. a) State and explain Darcy's law. What are the advantages of capillary pressure in soil? 6 M

b) A falling head permeability test was performed on a sample of silty sand. The time required for the head to fall in the stand pipe from 60 cm to 30 cm mark was 70 min. The sectional area of the stand pipe was 1.25 sq.cm. If the height and diameter of the sample were respectively 10 and 9 cm, determine the value of k. 8 M

4. a) Define total, neutral and effective stress. Explain quick sand condition. 6 M

b) A clay layer 3.66 m thick rests beneath a deposit of submerged sand of 7.92 m thick. The top of the sand is located 3.05 m below the surface of a lake. The saturated unit weight of the sand is 19 kN/m^3 and of clay is 18.36 kN/m^3. Compute

(i) the total vertical pressures
(ii) the pore water pressure and
(iii) the effective vertical pressure at mid height of the clay layer. 8 M

5. a) Discuss the Boussinesq assumptions. Compare the Boussinesq and Westergaard theories. 6 M

b) A column of a building transfers a concentrated load of 1000 kN to the soil in contact with the footing. Estimate vertical pressure at the footing points by making use of Boussinesq and Westergaard equations at radial distances of 4 m and at a depth of 4 m. 8 M

6. a) Explain: (i) Factors that affect compaction
(ii) Zero air voids line 6 M

b) A sample of soil compacted according to the Standard Proctor test has a density of 2.06 g/cm^3 at 100 % compaction and at the optimum water content of 14 %. What is the dry density? What is the dry density at zero air-voids? If the voids become filled with water what would be the saturated density? Assume G = 2.67 8 M

7. a) Define 6 M
(i) Consolidation
(ii) Coefficient of compressibility and
(iii) Compression Index

b) A stratum of normally loaded clay of 7 m thick is located at a depth 12 m below the ground level. The natural moisture content of the clay is 43 percent and its liquid limit is 48

percent. The specific gravity of the soil particle is 2.76. The water table is located at a depth 5 m below the ground surface. The soil is sand above the clay stratum. The submerged unit weight of the sand is 11 kN/m^3 and the same weighs 1811 kN/m^3 above the water table. The average increase in the pressure at the centre of clay stratum is 120 11 kN/m^3 due to the weight of a building that will be constructed on the sand above the clay stratum. Estimate the expected settlement of the structure. 8 M

8. a) Write short notes on 6 M

(i) Liquefaction

(ii) Unconsolidated undrained test

b) What is Coulomb's equation for shear strength of soil? Discuss the factors which affect the shear strength parameters of soil? Discuss the advantage and disadvantage of triaxial compression test? 8 M