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10CV54

Fifth Semester B.E. Degree Examination, June/July 2019
Geotechnical Engineering - I

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART - A

1 a. Define Void Ratio, Porosity , Percent air voids , Percent air content and Degree of saturation. **(05 Marks)**

b. Prove the following relationship from the Phase diagram

$$\gamma_b = \left(\frac{G_s + S.e}{1+e}\right)\gamma_w \ .$$ **(05 Marks)**

c. A moist soil sample weighs 3.52N. After drying in an oven, its weight is reduced to 2.9N. The specific gravity of solids and the mass specific gravity are respectively 2.65 and 1.85. Determine the water content , Void ratio , Porosity and the degree of saturation. Take $\gamma_w = 10\ kN/m^3$. **(10 Marks)**

2 a. Write a note on Sieve analysis. **(06 Marks)**

b. How do you calculate Liquid limit by using A Casagrande's device? **(06 Marks)**

c. A soil has dry density of 18.16 kN/m^3 in the natural condition. The same soil is having dry densities in the loose and dense states are 14.14 kN/m^3 and 19.07 kN/m^3 respectively. Find the relative density. Take G = 2.67 , $\gamma_w = 10\ kN/m^3$. **(08 Marks)**

3 a. Write a detailed note on IS classification. **(10 Marks)**

b. Differentiate between the Kaolinite , Illite and Montmorillonite clay minerals with neat sketches. **(10 Marks)**

4 a. Determination of Permeability from Laboratory by any one of the methods. **(08 Marks)**

b. Define Coefficient of Permeability , Discharge velocity , Seepage velocity and Coefficient of Percolation. **(06 Marks)**

c. Determine the average coefficient of permeability in the horizontal and vertical directions for a deposit consisting of 3 layers of thickness 5m, 1m and 2.5m and having the coefficients of permeability of 3×10^{-2} mm/sec , 3×10^{-5} mm/sec and 4×10^{-2} mm/sec respectively. **(06 Marks)**

PART - B

5 a. How do you calculate the shear strength parameters from Mohr – coulomb theory? **(06 Marks)**

b. Discuss about the factors affecting shear strength of sands and clays. **(08 Marks)**

c. A services of direct shear tests was conducted on a soil, each test was carried out till the sample failed. The following results were obtained.

Sample No	Normal stress (kN/m^2)	Shear stress (kN/m^2)
1	15	18
2	30	25
3	45	32

Determine the Cohesion intercept and the angle of shearing resistance. **(06 Marks)**

6 a. Write a note on Standard Proctors compaction test. **(06 Marks)**

b. How do you calculate the water content in the field by using Proctor's needle method? **(06 Marks)**

c. The following results were obtained from a standard compaction test as a sample of soil.

Water content (%)	0.12	0.14	0.16	0.18	0.20	0.22
Mass of wet soil (kg)	1.68	1.85	1.91	1.87	1.87	1.85

The volume of the mould used was 950 ml. Plot the compaction curve and calculate the $r_{d\,max}$ and OMC. Also calculate the void ratio and the degree of saturation at OMC. **(08 Marks)**

7 a. Write the assumptions of Terzaghi's 1 – D Consolidation theory. **(08 Marks)**

b. Determine the Pre – consolidation pressure by A – Casagrande's graphical method. **(06 Marks)**

c. In a consolidation test, when the load was changed from 50 to 100 KPa, the void ratio changed from 0.7 to 0.65. Determine the coefficient of volume decrease M_V and the compression index C_C. **(06 Marks)**

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8 a. What are the advantages and disadvantages of Direct shear test? **(06 Marks)**

b. List out the tests in the laboratory based on the drainage conditions. **(04 Marks)**

c. Determination of coefficient of consolidation by Square root of time fitting method. **(10 Marks)**

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