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10CV54

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
Geotechnical Engineering – I

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With neat sketches describe 3-phase diagram and 2-phase diagram of soil. **(10 Marks)**

b. Define voids ratio, porosity, percentage air voids, air content, and degree of saturation. **(10 Marks)**

2 a. A clay sample has liquid limit and plastic limit of 96% and 24% respectively. Sedimentation analysis reveals that the clay soil has 50% of the particles smaller than 0.002mm. Indicate the activity of soil classification of the clay and the probable type of clay mineral. **(10 Marks)**

b. The mass specific gravity of a fully saturated specimen of clay having a water content of 36% is 1.86. On oven drying, the man specific gravity drops to 1.72. Calculate the specific gravity of clay and its shrinkage limit. **(10 Marks)**

3 a. Describe plasticity chart and its importance in soil classification system. **(08 Marks)**

b. The following data on consistency limit are available for two soils A and B.

	Soil A	Soil B
1. Plastic limit	16%	19%
2. Liquid limit	30%	52%
3. Flow index	11	6
4. Natural water content	32%	40%

Find which soil is (i) more plastic (ii) better foundation material on remoulding (iii) better shear strength as a function of water content (iv) better shear strength at plastic limit. Classify as per ISCS. Do these soils have organic matter? **(07 Marks)**

c. Describe electric diffuse double layer theory with a neat figure. **(05 Marks)**

4 a. With neat sketch, define Darcy's law also what are the assumption and limitations of Darcy's law. **(06 Marks)**

b. In a constant head Permeameter test, the following observations were taken:

Distance between piezometer tappings = 100mm
Difference of water level in piezometers = 60mm
Diameter of the test sample = 100mm
Quantity of water collected = 350ml
Duration of the test = 270 seconds

Determine the coefficient of permeability of the soil. **(08 Marks)**

c. The falling-head permeability test was conducted on a soil sample of 4cm diameter and 18cm length. The head fell from 1.0m to 0.40m in 20 minutes. If the cross-sectional area of the stand pipe was $1cm^2$, determine the coefficient of permeability. **(06 Marks)**

PART – B

5 a. Describe concept of shear strength and explain Mohr-Coulomb theory. **(10 Marks)**

b. A series of direct shear, test 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 C and ϕ **(10 Marks)**

6 a. Differentiate between standard and modified proctor's compaction tests. **(06 Marks)**

b. What are the factors affecting compaction? **(06 Marks)**

c. Describe field compaction control with proctor needle method. **(08 Marks)**

7 a. Describe Mass spring analogy and Terzaghi's one dimensional consolidation theory. **(12 Marks)**

b. Define normal consolidation, under consolidation and over consolidation. **(08 Marks)**

8 a. What are the advantages and disadvantages of direct shear test and triaxial compression test. **(10 Marks)**

b. Explain the procedure of conducting coefficient of consolidation by square root of time fitting method. **(10 Marks)**

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