CBCS SCHEME

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15CV45

Fourth Semester B.E. Degree Examination, July/August 2021
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions.***

1 a. With the help of 3-phase diagram, define Void ratio, Porosity, Water content and degree of saturation. **(08 Marks)**

b. A partially saturated soil sample obtained from an earthfill has a natural moisture content of 22% and a unit weight of 19.62 KN/m^3. Assuming G = 2.7, compute degree of saturation and void ratio. If subsequently the soil gets saturated, determine its unit weight. **(08 Marks)**

2 a. With a neat sketch, explain the importance of plasticity chart. **(08 Marks)**

b. Liquid limit test on a clayey sample gave the following results. The plastic limit of the soil is 20%.

No. of blows	12	18	22	34
Water content, %	56	52	50	45

Plot flow curve and obtain liquid limit, flow index, plasticity index and toughness index. **(08 Marks)**

3 a. Define diffuse double layer and exchangeable ions with neat sketch. **(08 Marks)**

b. Explain the following clay minerals with neat sketches of their basic structural units:
(i) Kaolinite
(ii) Montmorillonite. **(08 Marks)**

4 a. Discuss the effect of compaction on different soil properties. **(06 Marks)**

b. Differentiate between standard and modified proctor tests. **(04 Marks)**

c. The observations of a standard Proctor's test are given below:

Dry density, KN/m^3	16.16	17.06	18.61	18.95	18.78	17.13
Water Content, %	5.02	8.81	11.25	13.05	14.40	19.25

(i) Plot compaction curve and determine OMC.
(ii) Also compute void ratio and degree of saturation at OMC. Take G = 2.77 **(06 Marks)**

5 a. What are the assumptions and limitations of Darcy's law? **(08 Marks)**

b. Explain with a neat sketch the method of locating the phreatic line in a homogeneous earth dam with horizontal filter. **(08 Marks)**

6 a. What is a flownet? Briefly explain the characteristics and user of flownets. **(08 Marks)**

b. A clay structure of thickness 8 m is located at a depth of 6 m below the ground surface, it is overlayed by fine sand. The water table is located at a depth of 2 m below ground surface. For find sand submerged unit weight is 10.2 KN/m^3. The moist unit weight of sand located above the water table is 16 KN/m^3. For clay layer G = 2.76 and W = 25%. Compute the effective stress at the middle of clay layer. **(08 Marks)**

7 a. Explain mass-spring analogy of consolidation of soils. **(06 Marks)**

b. How preconsolidation pressure is determined by casagrande's method? **(06 Marks)**

c. A soil sample 2 cms thickness takes 20 minutes to reach 20% consolidation. Find the time for a clay layer 6 cms thick to reach 40% consolidation. Assume double drainage in both the cases. **(04 Marks)**

8 a. What are curve fitting methods used in consolidation test? Explain any one with a neat sketch. **(08 Marks)**

b. There is a bed of compressible clay of 4 m thickness with pervious sand on top and impervious rock at the bottom. In a consolidation test on an undisturbed specimen of clay from this deposit, 90% settlement was reached in 4 hours. The specimen was 20 mm thick. Estimate the time in years for the building founded over this deposit to reach 90% of its final settlement. **(08 Marks)**

9 a. What are the advantages and disadvantages of direct shear test over triaxial shear test? **(08 Marks)**

b. Explain sensitivity and thixotropy of clay. **(08 Marks)**

10 a. Explain Mohr-Coulomb failure theory of soil. **(06 Marks)**

b. What are the factors affecting shear strength of soil? **(04 Marks)**

c. In a shear test conducted on river sand, the following results were obtained:

Normal stress, KN/m^2	22.2	44.4	66.7	88.9
Shear stress, KN/m^2	13.9	28.06	41.4	55.8

Determine C and ϕ. **(06 Marks)**

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