CBCS SCHEME

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17CV45

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Missing data if any, may be suitably assumed.***

Module-1

1 a. Sketch the phase diagram for a soil and indicate the volumes and weights of the phases on it. Define : Void ratio , Degree of saturation and Water content. **(10 Marks)**

b. What is the purpose of soil classification? Describe any three methods of field identification of soils. **(10 Marks)**

OR

2 a. Describe the laboratory method of determining the plastic limit and shrinkage limit of a soil. **(10 Marks)**

b. A soil sample with specific gravity of solids 2.70 has a mass specific gravity of 1.84. Assuming the soil to the perfectly dry, determine the void ratio. **(05 Marks)**

c. Describe the processes of soil formation. **(05 Marks)**

Module-2

3 a. Define 'Structure of a soil'. With neat sketches, describe the different types of structures of soil. **(10 Marks)**

b. With a neat sketch, explain the electrical diffuse double layer theory. **(10 Marks)**

OR

4 a. Discuss on the factors that influence the compaction of soils. Indicate their influence with illustrative sketches of compaction curves. **(10 Marks)**

b. Write a note on 'Proctor's Needle' and its use in field compaction control. **(04 Marks)**

c. Discuss the different compacting equipments used for compacting the soil in field. **(06 Marks)**

Module-3

5 a. List and explain the various factors that affect the permeability of a soil. **(10 Marks)**

b. The discharge of water collected from a constant head permeameter in 15 minutes is 500mℓ. The internal diameter of permeameter is 5cm and the measured difference in head between two gauging points 15cm vertically apart is 40cm. Calculate the co-efficient of permeability. If the dry weight of the 15cm long sample is 4.86N and the specific gravity of the solid is 2.65. Calculate the seepage velocity. **(10 Marks)**

OR

6 a. Define Darcy's Law. Derive the Laplace equation for seepage flow. **(10 Marks)**

b. A deposit of cohesionless soil with a permeability of 10^{-4} m/s has a depth of 6m with an impervious rock below. A sheet pile wall is driven into this deposit to a depth of 3m. The wall extends above the surface of the soil by 3m and 3m depth of water acts on one side and water level on the other side is 6.5m above the impervious rock. Sketch the flow net and determine the seepage quantity per meter length of the wall. **(05 Marks)**

c. What is a Flow net? What are its characteristics and uses? **(05 Marks)**

Module-4

7 a. Explain the method of determination of coefficient of consolidation by Logarithmic time method. **(07 Marks)**

b. With a neat sketch, explain Casagrande method of determination of preconsolidation pressure. **(07 Marks)**

c. In a consolidation teat, the void ratio of soil sample decreases from 1.20 to 1.10, when the pressure increases from 160 kN/m^2 to 320 kN/m^2. Determine the coefficient of consolidation, if $K = 8 \times 10^{-7}$ mm/s. **(06 Marks)**

OR

8 a. Explain the Mass – Spring Analogy theory of consolidation as applied to saturated clay soils. **(07 Marks)**

b. Explain normally consolidated, under consolidation and over consolidated soils. **(06 Marks)**

c. There is a bed of compressible clay of 4m 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 hrs. The specimen was 20mm thick. Estimate the time in years for the building founded over this deposit to reach 90% of its final settlement. **(07 Marks)**

Module-5

9 a. Enumerate the various laboratory and field tests employed for determining shear strength of soil. Explain the triaxial compression test. **(10 Marks)**

b. What do you mean by sensitivity and thixotrophy in soils? **(04 Marks)**

c. The stresses at failure on failure plane in a cohesionless soil mass are : Shear stress = $4kN/m^2$ and Normal stress = $10kN/m^2$. Determine the resultant stress on the failure plane, the angle of internal friction of soil and the angle of inclination of failure plane to the major principle plane. **(06 Marks)**

OR

10 a. Explain the types of shear tests based on drainage conditions. **(06 Marks)**

b. With a neat sketch, explain total and effective stress paths. **(06 Marks)**

c. The results of shear box test are as follows :

Trail no	1	2	3	4
Normal stress, kN/m^2	50	100	200	300
Shear stress kN/m^2	36	80	154	235

Determine the shear parameters. Will the failure occur on the plane within the soil mass, when shear stress is 154 kN/m^2 and normal stress is $200kN/m^2$? **(08 Marks)**

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