CBCS SCHEME

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17CV45

Fourth Semester B.E. Degree Examination, June/July 2023
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain briefly on Formation of Soils. **(04 Marks)**

b. Explain the laboratory procedure to calculate the in – situ density of soil. **(06 Marks)**

c. The net unit weight of a clay sample compacted at a water content of 20% was found to be 18.80 kN/m^3 , G = 2.70. Determine the degree of saturation , percentage air voids and dry unit weight. **(10 Marks)**

OR

2 a. Explain the procedure for Sieve analysis as per IS : 2720 (part IV) - 1965. **(06 Marks)**

b. Define Atterberg limits as applied to soils. **(06 Marks)**

c. The liquid limit and plastic limit of a soil sample are 65% and 40% respectively. Compute its Consistency Index , Liquidity Index , Flow Index and Toughness Index. The water content changes from 80% to 40% for a tenfold increase in the number of blows required to close the groove in the standard liquid limit apparatus. **(08 Marks)**

Module-2

3 a. Explain with neat sketches, the different structures of soil. **(08 Marks)**

b. List the factors affecting Compaction. **(04 Marks)**

c. Following are the results of a compaction test. Plot the compaction curve to a suitable scale and determine the maximum dry density and optimum moisture content.

BULK DENSITY r(kN/m^3)	19.25	20.95	21.50	21.25	20.70
WATER CONTENT w (%)	10.0	12.0	14.3	16.1	18.2

(08 Marks)

OR

4 a. Explain with sketches, Common clay minerals of soil. **(09 Marks)**

b. What are the effects of Compaction? **(03 Marks)**

c. A core – cutter 125mm heigh and 120mm in diameter weighs 10.80N when empty. It is used to determine the in – situ density of a compacted soil in an embankment. The weight of core – cutter full of soil is 30.10N. The water content of the soil is 12.2%. Determine the in-situ dry unit weight and void ratio. **(08 Marks)**

Module-3

5 a. What is a Flow Net? What are the uses and characteristics of flow nets? **(08 Marks)**

b. In a flow net for a sheet pile wall, the number of flow paths is 5 and the number of equipotential drops is 10. Determine the seepage under the wall in litres per day. Given the coefficient of permeability K = 6 × 10^{-3} mm/s and head H = 4.5m. **(12 Marks)**

OR

6 a. What are the factors affecting permeability? Explain them briefly. **(06 Marks)**

b. Explain the laboratory procedure for the following :

i) Constant Head Permeability Test ii) Falling Head Permeability Test. **(14 Marks)**

Module-4

7 a. Explain with neat sketches, the Mass Spring Analogy. **(08 Marks)**

b. Explain Normally consolidated Soil and Over – Consolidated Soil. **(06 Marks)**

c. A saturated clay layer of 5m thickness takes 1.5 years for 50% primary consolidation , when drained on both sides. Its coefficient of volume change m_v is 1.5×10^{-3} m^2/kN. Determine the coefficient of consolidation in m^2/yr and the coefficient of permeability in m/yr. Assume $r_w = 10kN/m^2$. **(06 Marks)**

OR

8 a. Explain with neat sketches, the Mass Spring Analogy. **(08 Marks)**

b. Explain Square root of Time Fitting method. **(04 Marks)**

c. A 20m thick isotropic clay stratum overlies an impervious rock. The coefficient of consolidation of soil is 5×10^{-8} mm^2/s. Find the time required for 50% and 90% consolidation. Time factor for U = 50% is 0.2 and for U = 90% is 0.85, where U is the degree of consolidation. **(08 Marks)**

Module-5

9 a. Explain Mohr – Coulomb theory of soil. **(06 Marks)**

b. What are the factors affecting the shear strength of soil? **(06 Marks)**

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

Normal force (N)	80	160	240	320	400	480
Shear force (N)	50	101	149	201	248	302

(08 Marks)

OR

10 a. Explain Thixotrophy and Sensitivity. **(04 Marks)**

b. Explain the laboratory procedure to conduct the "Direct Shear Test" on soil. **(06 Marks)**

c. On a saturated triaxial cylindrical test specimen of soil, the major and minor principal stresses applied are $200kN/m^2$ and $60kN/m^2$ respectively. Check whether the test specimen will fail if it is assumed that the soil will have $C' = 5kN/m^2$ and $\phi' = 25°$ with pore pressure = $20kN/m^2$. **(10 Marks)**

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