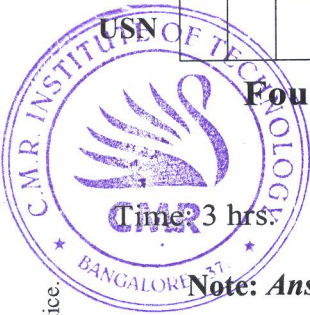


CBCS SCHEME

17CV45



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

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 γ (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 high 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 $K = 6 \times 10^{-3} \text{ mm/s}$ and head $H = 4.5\text{m}$. (12 Marks)

OR

- 6 a. What are the factors affecting permeability? Explain them briefly. (06 Marks)
 b. Explain the laboratory procedure for the following : (14 Marks)
 i) Constant Head Permeability Test ii) Falling Head Permeability Test.

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 $1.5 \times 10^{-3} \text{ m}^2/\text{kN}$. Determine the coefficient of consolidation in m^2/yr and the coefficient of permeability in m/yr . Assume $r_w = 10\text{kN}/\text{m}^2$. (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 $5 \times 10^{-8} \text{ mm}^2/\text{s}$. 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 Thixotropy 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 $200\text{kN}/\text{m}^2$ and $60\text{kN}/\text{m}^2$ respectively. Check whether the test specimen will fail if it is assumed that the soil will have $C' = 5\text{kN}/\text{m}^2$ and $\phi' = 25^\circ$ with pore pressure = $20\text{kN}/\text{m}^2$. (10 Marks)

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