



CBCS SCHEME

USN

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15CV45

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 Basic Geo-Technical Engineering

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. With the help of three phase diagram, explain :
- Void ratio
 - Porosity
 - Water content
 - Degree of saturation. (08 Marks)
- b. Explain the laboratory procedure to determine the water content present in the soil using hot air oven. (04 Marks)
- c. An oven dried soil weighing 1.854N is placed in a pyknometer. The total weight of the pyknometer along with soil and water is 15.51N. The pyknometer with water alone weighs 14.34N. Determine the specific gravity of the soil. (04 Marks)

OR

- 2 a. Define Liquid limit, plastic limit and shrinkage limit. (06 Marks)
- b. Explain Indian standard soil classification system. (06 Marks)
- c. Determine the dry density and void ratio. Given $V_b = 26 \text{ kN/m}^3$, $W = 16\%$, $G = 2.67$. (04 Marks)

Module-2

- 3 a. Explain with sketches, the common clay minerals. (08 Marks)
- b. A cohesive soil yields a maximum dry density of 18 kN/m^3 at an OMC of 16% during a standard proctor test. If $G = 2.65$. What is the degree of saturation? (08 Marks)

OR

- 4 a. Distinguish between standard proctor and modified proctor tests. (04 Marks)
- b. Explain the laboratory procedure for conducting test on soil to determine its maximum dry density and optimum moisture content. (06 Marks)
- c. What are the effects of compaction? (06 Marks)

Module-3

- 5 a. What is a flow net? What are the uses and characteristics of flow nets? (08 Marks)
- b. Compute the quantity of water seeping under a weir per day for which the flow net has been constructed. The coefficient of permeability is $2 \times 10^{-2} \text{ mm/s}$, $n_f = 5$ and $n_d = 18$. The difference in water level between O/S and D/S is 3.0m. The length of weir is 60m. (08 Marks)

OR

- 6 a. What are the factors affecting permeability? Explain them briefly. (06 Marks)
- b. A soil sample 90mm high and 6000mm is in cross-section was subjected to a falling-head permeability test. The head fell from 500mm to 300mm in 1500s. The permeability of the soil was $2.4 \times 10^{-3} \text{ mm/s}$. Determine the diameter of its stand pipe. (10 Marks)

Module-4

- 7 a. Explain Mass-Spring Analogy. (08 Marks)
 b. Explain over consolidated soil, normally consolidated soil and under consolidated soil. (08 Marks)

OR

- 8 a. Explain square root of time fitting method. (06 Marks)
 b. A 20m thick isotropic clay stratum over lies an impervious rock. The coefficient of consolidation of soil is 5×10^{-8} mm²/s. Find the time required for 50% and 90% consolidation. Time factors are 0.2 and 0.85 for $u = 50\%$ and $u = 90\%$ respectively. (10 Marks)

Module-5

- 9 a. Explain Mohr–Coulomb failure theory of soil. (04 Marks)
 b. What are the factors affecting the shear strength of soil. (04 Marks)
 c. A direct shear test was conducted on a soil and the following results were obtained.

| | | | | |
|---------------|-------------------|----|-----|-----|
| Normal stress | kN/m ² | 55 | 105 | 145 |
| Shear stress | kN/m ² | 30 | 36 | 41 |

Determine graphically, the cohesive strength and the angle of shearing resistance.

(08 Marks)

OR

- 10 a. Explain the list procedure involved in conducting the direct shear test on soil. (06 Marks)
 b. Define thixotropy and sensitivity. (04 Marks)
 c. When an unconfined compression test is conducted on a cylinder of soil, it fails under an axial stress of 120kN/m². The failure plane makes an angle of 50° with the horizontal. Determine the cohesion and the angle of internal friction of soil. (06 Marks)
