

# CBGS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

18CV54

## Fifth Semester B.E. Degree Examination, June/July 2025 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. With the help of phase diagram of soil, define the terms : (10 Marks)  
i) Void ratio ii) Water content iii) Degree of saturation iv) Unit weight of soil.  
b. Following results were obtained from liquid limit test on a clay sample, whose plastic limit is 13% and natural water content is 18%. Determine the following :

Number of blows :	5	16	23	42
Water content (%) :	32	27.8	25.5	23.3

(10 Marks)

**OR**

- 2 a. Sketch a typical grain size curve for i) Well graded soil ii) Uniformly graded soil. Calculate uniformity coefficient and co-efficient curvature from the curve. (10 Marks)  
b. A partially saturated sample from a borrow pit has a natural water content of 14% and bulk unit weight of 19 KN/m<sup>3</sup>. The specific gravity of solids is 2.70. Determine the void ratio and degree of saturation. What will be the unit weight of the sample on saturation? (10 Marks)

### Module-2

- 3 a. Distinguish between : (10 Marks)  
i) Primary and secondary valence bond.  
ii) Dispersed and flocculent structures  
iii) Structure of Kaolinite and montmorillonite  
iv) Isomorphism substitution and base exchange capacity. (10 Marks)  
b. Differentiate between standard and modified compaction test. (06 Marks)  
c. List the difference between compaction and consolidation. (04 Marks)

**OR**

- 4 a. Explain the factors affecting the degree of compaction. (10 Marks)  
b. In a standard proctor test, following results were obtained :

Mass of compacted soil in grams	1700	1890	2003	1960
Water content (%)	7.7	11.5	14.6	19.7

- i) Draw the compaction curve showing OMC and MDD.  
ii) Determine the void ratio and degree of saturation.  
Given Volume of mould = 950 CC and G = 2.65.

(10 Marks)

**Module-3**

- 5 a. Define Darcy's law. Derive an expression to relate discharge velocity and seepage velocity. (10 Marks)
- b. An earthen dam is built on a impervious foundation with a horizontal filter under the down stream slope. The horizontal and vertical permeability of the soil material in the dam are respectively  $4 \times 10^{-5}$  m/sec and  $1 \times 10^{-5}$  m/sec. Full reservoir level is 20m above downstream filter. Flow net consists of 4 flow channels and 15 equipotential drops. Estimate the seepage loss per meter length of the dam. (10 Marks)

**OR**

- 6 a. List the properties and uses of flow nets. (06 Marks)
- b. In a falling head permeameter test the initial head is 300cm it drops by 1cm in 3 minutes. How much longer should the test to be continued, if the head is to drop to 180cm? (04 Marks)
- c. Explain with neat sketch, the method of locating the phreatic line in a homogenous earth dam with horizontal filter. (10 Marks)

**Module-4**

- 7 a. Briefly explain Mohr. Coulomb's shear strength theory. (08 Marks)
- b. In a direct shear test, sample failed at a shear strength of 70 KN/m<sup>2</sup> when normal stress was 100 KN/m<sup>2</sup>. Determine angle of internal friction. Draw Mohr circle at failure. Mark major and minor principal planes. What are the values of major and minor principal stresses? (12 Marks)

**OR**

- 8 a. Classify and explain shear tests based on drainage conditions. (08 Marks)
- b. A soil has unconfined compression strength of 120 KN/m<sup>2</sup>. In triaxial compression test, specimen of same soil (under similar conditions) when subjected to cell pressure of 40KN/m<sup>2</sup>, failed at an additional stress of 160 KN/m<sup>2</sup>. Determine :  
i) Shear strength parameters.  
ii) Angle made by failure plane with axial stress direction in case of triaxial test. (12 Marks)

**Module-5**

- 9 a. Explain Mass spring analogy of consolidation of soils. (08 Marks)
- b. In a consolidation test, the void ratio of soil sample decreases from 1.20 to 1.10 when the pressure increases from 160 to 320 KN/m<sup>2</sup>. Determine the co-efficient of consolidation, if the co-efficient of permeability is  $8 \times 10^{-7}$  mm/sec. (12 Marks)

**OR**

- 10 a. With a sketch, explain how to determine the preconsolidation pressure by Casagrande's method. (08 Marks)
- b. A soil sample 2 cm thickness takes 20 minutes to reach 20% consolidation. Find the time for a clay layer 6 cm thick to reach 40% consolidation. Assume double drainage in both cases. (12 Marks)

\* \* \* \* \*