



# CBCS SCHEME

21CV54

## Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025 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. Define the following with the help of three phase diagram :  
i) Specific gravity  
ii) Air content  
iii) Degree of saturation  
iv) Voids ratio  
v) Water content. (10 Marks)
- b. With usual notations prove that  $eS = wG$ . (04 Marks)
- c. An undisturbed sample of soil has volume of  $100\text{cm}^3$  and mass of 100 g. On oven drying for 24 hours, the mass is reduced to 160 g, if the specific gravity of grains is 2.68. Determine the water content, voids ratio and degree of saturation of the soil. (06 Marks)

OR

- 2 a. Explain determination of in situ – density by sand replacement method. (10 Marks)
- b. Explain soil classification according to BIS classification. (06 Marks)
- c. Explain the particle size distribution curve. (04 Marks)

### Module-2

- 3 a. Explain factors affecting permeability of soil. (10 Marks)
- b. With neat sketch explain constant head permeability and falling head permeability test. (10 Marks)

OR

- 4 a. Explain permeability of stratified soil deposits for both the cases. (10 Marks)
- b. Write short notes on following :  
i) Effective stress  
ii) Total stress  
iii) Neutral stress. (06 Marks)
- c. In a falling head permeameter test, the initial head ( $t = 0$ ) is 40 cm. The head drops by 5 cm in 10 minutes. Calculate the time required to run the test for the final head to be at 20 cm. If the sample is 6 cm in height and  $50\text{ cm}^2$  in cross-sectional area, Calculate the co-efficient of permeability, taking area of stand pipe is  $0.5\text{ cm}^2$ . (04 Marks)

### Module-3

- 5 a. Explain factors affecting compaction of soil. (10 Marks)
- b. With neat sketch explain standard proctor test. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg,  $42+8=50$ , will be treated as malpractice.

OR

- 6 a. Explain mass spring analogy. (10 Marks)  
b. With a neat sketch explain laboratory consolidation test. (10 Marks)

**Module-4**

- 7 a. With a neat sketch explain direct shear test. (10 Marks)  
b. Explain Mohr – coulomb failure theory. (10 Marks)

OR

- 8 a. With a neat sketch explain Triaxial compression test. (10 Marks)  
b. Explain factors affecting shear strength of soils. (05 Marks)  
c. Explain Thixotrophy and sensitivity. (05 Marks)

**Module-5**

- 9 a. Explain the assumptions of Terzaghi's analysis for bearing capacity of soil. (07 Marks)  
b. Explain effect of water table on bearing capacity of soil (08 Marks)  
c. Explain factors affecting bearing capacity of soil. (05 Marks)

OR

- 10 a. Explain types of settlements. (10 Marks)  
b. Estimate the immediate settlement of a concrete footing  $1.5\text{m} \times 1.5\text{m}$  in size founded at a depth of 1 m in silty soil whose modulus of elasticity is  $90\text{ kg/cm}^2$ . The footing is expected to transmit a unit pressure of  $200\text{ kN/m}^2$ . (05 Marks)  
c. Explain effect of eccentricity of loading for bearing capacity of soil. (05 Marks)

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