

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V EXAMINATION – SUMMER 2025

Subject Code:3154007

Date:15-05-2025

Subject Name:Geotechnical Engineering

Time:02:30 PM TO 05:00 PM

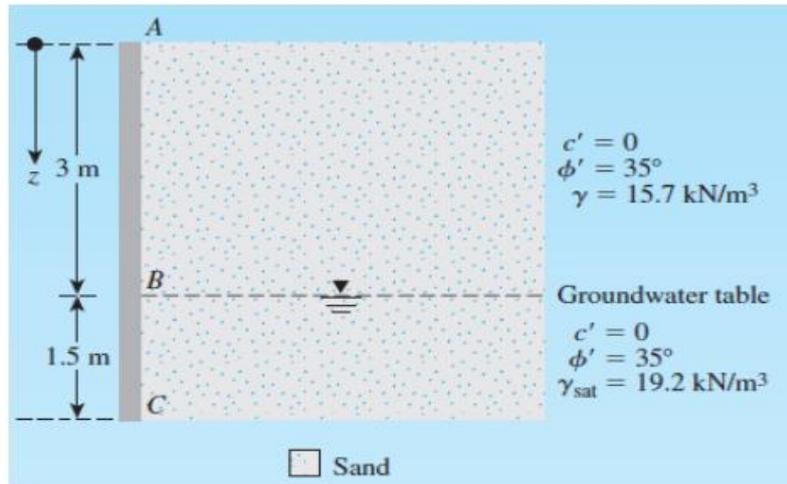
Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1** (a) What do you understand by index and engineering properties of soil? Discuss with suitable examples. **03**
- (b) Discuss in detail the difference between **04**
1. Compaction and Consolidation.
 2. Permeability and Seepage.
- (c) 1 m^3 of wet sample weights 20 kN. Its dry weight is 18 kN. Specific gravity is 2.67. Determine the water content, porosity, void ratio, and the degree of saturation. Also draw the phase diagram. **07**
- Q.2** (a) What do you understand by three phases with respect to soil? **03**
- (b) How fine-grained soils are classified according to plasticity chart? Explain. **04**
- (c) For a layered soil profile with the following conditions, calculate the ratio of K_H and K_V . Given: • $H_1= 2 \text{ m}$; $k_1 = 10^{-4} \text{ cm/sec}$ • $H_2= 3 \text{ m}$; $k_2 = 3.2 \times 10^{-2} \text{ cm/sec}$ • $H_3 = 4 \text{ m}$; $k_3 = 4.1 \times 10^{-5} \text{ cm/sec}$. **07**
- OR**
- (c) Describe in detail the Indian standard classification of soil. **07**
- Q.3** (a) Define the following. **03**
1. Total stress
 2. Pore pressure
 3. Effective stress
- (b) How the addition of water affects the dry density of the compacted soil? Explain with diagram. **04**
- (c) Describe in detail the standard proctor test to determine maximum dry density and optimum moisture content of soil. **07**
- OR**
- Q.3** (a) Write difference between the normal consolidated soil and pre-consolidated soil. **03**
- (b) Write the assumptions for Terzaghi's one dimensional consolidation. **04**
- (c) Discuss the procedure to determine consolidation parameters using oedometer. **07**
- Q.4** (a) On what factors does the lateral earth pressure depend? **03**
- (b) Explain the types of lateral earth pressure. **04**
- (c) Below figure show a 4.5 m high retaining wall, the wall is restrained from yielding. Calculate the lateral force P_0 per unit length of the wall. Assume $K_0= 0.538$. **07**



- Q.4** (a) Discuss various types of shear failures with respect to foundations. **03**
 (b) Write advantage and disadvantages of direct shear test. **04**
 (c) Discuss Rankine's earth pressure theory along with different cases. **07**

- Q.5** (a) Discuss Mohr-Coulomb failure criteria for shear failure of soils. **03**
 (b) Derive an expression for Laplace's equation of continuity. **04**
 (c) Discuss in detail the types of Triaxial test with examples. **07**

OR

- Q.5** (a) Mention laboratory methods to determine permeability of soils. **03**
 (b) Write assumptions for Coulomb's earth pressure theory. **04**
 (c) Describe method of slices to determine slope stability of a c- Φ soil. **07**
