

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2024

Subject Code:3154007

Date:28-11-2024

Subject Name:Geotechnical Engineering

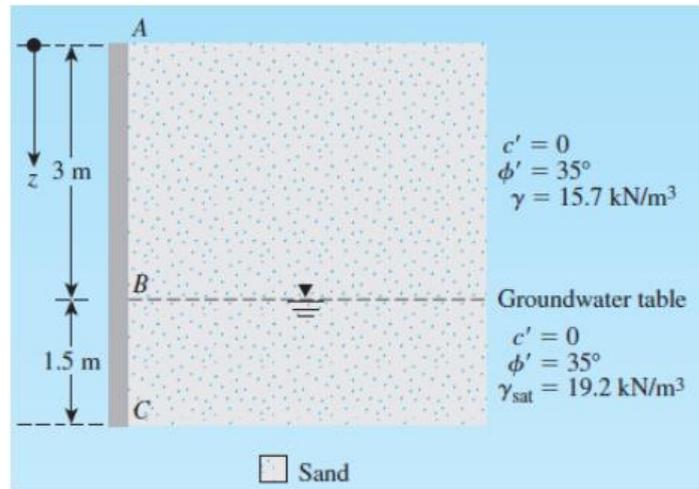
Time:10:30 AM TO 01:00 PM

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) Explain the importance of geotechnical engineering.	03
	(b) What do you understand by three phases with respect to soil?	04
	(c) 1 m ³ of wet sample weights 220 kN. Its dry weight is 18 kN. Specific gravity is 2.65. Determine the water content, porosity, void ratio, and the degree of saturation. Also draw the phase diagram.	07
Q.2	(a) How can you determine permeability of stratified deposits?	03
	(b) Discuss in detail the difference between <ol style="list-style-type: none">1. Compaction and Consolidation.2. Permeability and Seepage.	04
	(c) For a layered soil profile with the following conditions, calculate the ratio of K_H and K_V . Given: • $H_1 = 3$ m; $k_1 = 10^{-4}$ cm/sec • $H_2 = 4$ m; $k_2 = 3.2 \times 10^{-2}$ cm/sec • $H_3 = 5$ m; $k_3 = 4.1 \times 10^{-5}$ cm/sec.	07
OR		
	(c) Draw a flow chart explaining the Indian Standard (IS) soil classification system.	07
Q.3	(a) Define the following. <ol style="list-style-type: none">1. Total stress2. Pore pressure3. Effective stress	03
	(b) How the addition of water affects the dry density of the compacted soil? Explain with diagram.	04
	(c) Describe the methods for field compaction of soil.	07
OR		
Q.3	(a) Write difference between the normal consolidated soil and pre-consolidated soil.	03
	(b) Explain Terzaghi's spring analogy theory.	04
	(c) Discuss the procedure to determine maximum dry density using standard proctor test.	07
Q.4	(a) Write an expression to determine earth pressure at rest with notations.	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



OR

- Q.4**
- (a) Explain general, local and punching shear failure. **03**
 - (b) Write advantage and disadvantages of direct shear test. **04**
 - (c) Discuss Coulomb's earth pressure theory along with assumptions. **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 Rankine's earth pressure theory. **04**
 - (c) Describe method of slices to determine slope stability of a $c-\Phi$ soil. **07**
