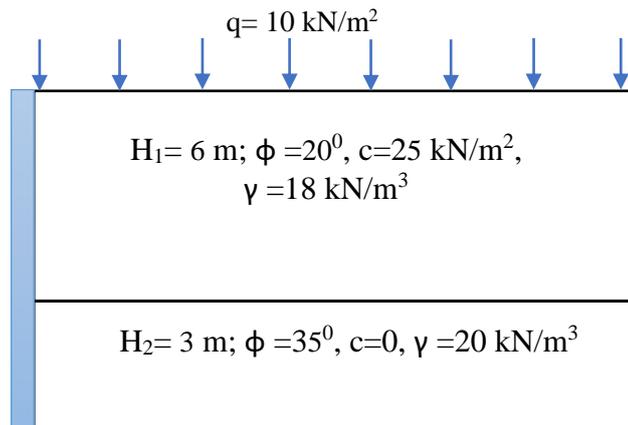


GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – SUMMER 2021****Subject Code:3154007****Date:09/09/2021****Subject Name:Geotechnical Engineering****Time:10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

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) Demonstrate one dimensional consolidation phenomenon with spring analogy. | 03 |
| | (b) Critically differentiate between Rankine's and Coulomb's earth pressure theories. | 04 |
| | (c) Draw a neat sketch and explain three phase diagram. With the help of diagram, prove $n = e/(1+e)$ | 07 |
| Q.2 | (a) What is safe bearing capacity? | 03 |
| | (b) A soil layer settles by 50 cm in 50 years under double drainage condition. what will the time period for the same settlement if a sand layer introduced at the center of the clay layer? | 04 |
| | (c) Draw the active earth pressure diagram for retaining wall shown below. | 07 |

**OR**

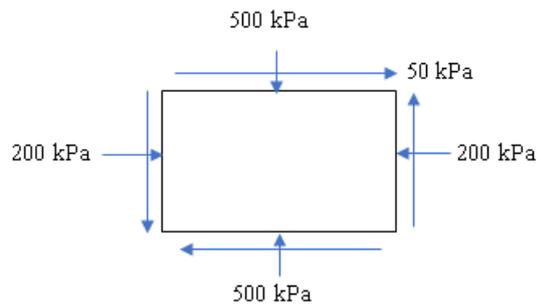
- | | | |
|------------|---|-----------|
| | (c) Draw the passive earth pressure diagram for retaining wall shown above. | 07 |
| Q.3 | (a) What is quick sand? | 03 |
| | (b) Derive an equation for factor of safety of infinite dry soil slope. | 04 |

- (c) Determine the ratio of the vertical to the horizontal permeability of the soil. Also determine the resultant permeability for soil strata. **07**

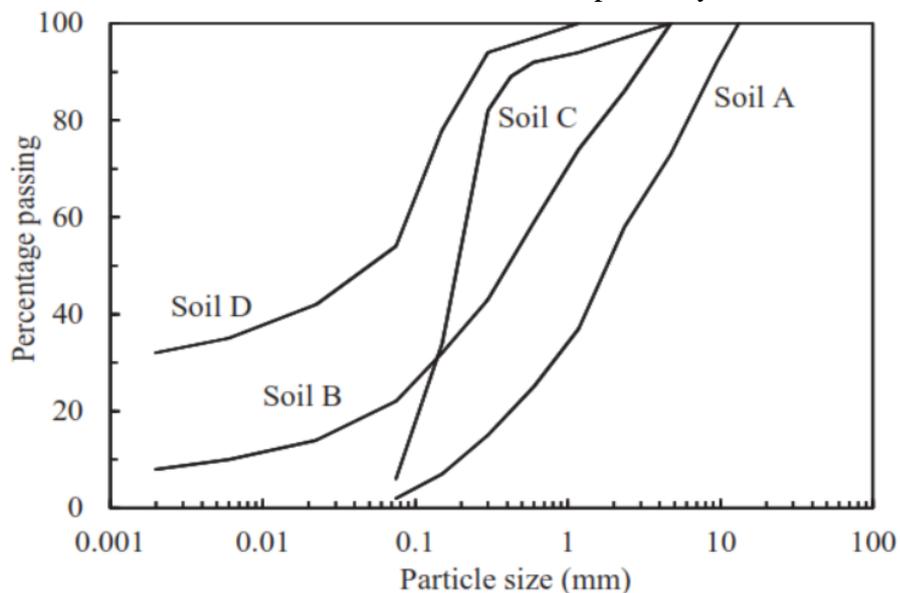
$H_1 = 2 \text{ m}; k_1 = 2 \times 10^{-3} \text{ m/day}$
$H_2 = 3 \text{ m}; k_2 = 2 \times 10^{-8} \text{ m/day}$
$H_3 = 4 \text{ m}; k_3 = 2 \times 10^{-3} \text{ mm/day}$
$H_4 = 6 \text{ m}; k_4 = 2 \times 10^{-4} \text{ m/day}$

OR

- Q.3** (a) 1 kg of soil has water content of 10% and void ratio of 0.5 at natural state. Determine water content added to get 100% saturation. Specific gravity of soil is 2.60. **03**
- (b) Derive an equation for coefficient of earth pressure at rest condition. **04**
- (c) Draw the Mohr's circle for soil elements shown below, and locate the position of pole. **07**



- Q.4** (a) How is consolidation different from soil compaction? **03**
- (b) Enlist various compaction instruments used in field. Specify their suitability for different soils. **04**
- (c) Classify the soils A, B, C and D, following the Indian Standard. Soil B consists of silt and coarse soil. For Soil D, the liquid and plastic limits are determined to be 50% and 20%, respectively. **07**



OR

- Q.4** (a) Classify the circular slope failure based on depth factor. **03**
(b) Enlist factor affecting permeability of soil. Explain any two in detail. **04**
(c) What are advantages of tri-axial test over direct shear test. Classify tri-axial compression tests based on drainage conditions. **07**
- Q.5** (a) What are assumptions made in Terzaghi's theory of one-dimensional consolidation. **03**
(b) Describe Proctor and modified Proctor tests. **04**
(c) Write short note on any four: **07**
 Direct shear test
 Factors of safety
 Bearing capacity
 Mohr-coulomb theory
 Boussinesq's theory

OR

- Q.5** (a) The specific gravity and void ratio of soil is measured to be 2.65 and 1, respectively. Determine seepage velocity if the discharge velocity is 0.003 m/day. **03**
(b) Explain the method to determine the pre-consolidation pressure. **04**
(c) Write short note on any four: **07**
 Proctor test
 Sensitivity of soil
 Mohs's theory
 Flow net
 Vane shear test