

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (NEW) EXAMINATION – WINTER 2023

Subject Code:3130606

Date:12-01-2024

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) Define the following term (i) Degree of saturation (ii) Liquid limit (iii) Void ratio	03
	(b) Derive the relation between Specific Gravity (G), void ratio (e), degree of saturation (S) and density (ρ).	04
	(c) A soil sample has wet weight of 20 kN/m^3 and water content 10%, specific gravity 2.7. Calculate dry unit weight, void ratio, and degree of saturation.	07
Q.2	(a) Classify the soil based on IS soil classification with following results. 1. 60 % soil retain on 4.75 mm sieve, $C_u = 5$, $C_c = 0.85$. 2. 70% soil passes through 75 μ , LL = 60%, plasticity above A line.	03
	(b) 430 ml of water is collected in 10 minutes under constant head permeability test. The length and cross-sectional area are 6 cm and 50 cm^2 respectively. Determine coefficient of permeability if constant head is 40 cm.	04
	(c) Describe standard proctor compaction test.	07
OR		
	(c) Enlist factors affecting permeability of soil and illustrate any two in detail.	07
Q.3	(a) Define following terms: (i) Coefficient of consolidation. (ii) Co-efficient of volume change. (iii) Compression index.	03
	(b) Differentiate between consolidated drain and consolidated undrain test.	04
	(c) A retaining wall 4.5 m in heights supports cohesionless back fill up to top surface. It also supports UDL 30 kN/m . The soil is having $\gamma = 18 \text{ kN/m}^3$ and $\phi = 30^\circ$. Draw pressure distribution diagram for active earth pressure and determine total pressure intensity at base, horizontal thrust and its location from bottom.	07
OR		
Q.3	(a) Describe spring analogy method for consolidation.	03
	(b) Draw neat diagram for triaxial test and labels all the parts.	04
	(c) A retaining wall 5 m high with vertical back, supports cohesive soil. The unit weight of soil is 18 kN/m^3 and angle of internal friction is zero. Determine (i) Pressure intensity at top (ii) Pressure intensity at base (iii) Depth of tension crack. Take $C = 20 \text{ kN/m}^2$	07
Q.4	(a) Describe various types of slope failures.	03
	(b) Derive the equation for factor of safety for infinite slope and cohesion less soil	04

- (c) Two-line load located at 3 m distance carries 80 kN/m and 60 kN/m load. Determine the vertical stress at 0.8 m below each line and at the center of both the line. **07**

OR

- Q.4** (a) Derive the equation for critical height for cohesive soil in infinite slope. **03**
(b) Describe the method for locating the center for critical circle. **04**
(c) A concentrated load of 750 kN acts on the surface of soil. Calculate variation of vertical stress up to 4.0 m horizontal distance at 1 m interval and depth of 1.5 m. Also plot the stress distribution curve. **07**

- Q.5** (a) Differentiate between General shear failure and Local shear failure **03**
(b) List out assumption made in Terzaghi's bearing capacity theory. **04**
(c) Explain the effects of water table on bearing capacity of soil **07**

OR

- Q.5** (a) Differentiate between end bearing pile and friction pile. **03**
(b) Provide detail classification of the pile foundation **04**
(c) Describe the under-ream pile foundation **07**
