SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR
Applied Mechanics Department

Student Notice

Date: 17/09/2024

Following students of BE Civil Engineering semester 3 having less attendance in lecture and laboratory session of Geotechnical Engineering (3130606) Subject. They all are instructed to write a complete paper solution of **GTU Winter 2022 dated: 20-02-2023** with the option before 04/10/2024. Your final marks of Internal components will be considered only if you submitted the Extra work.

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Subject Coordinator

Prof. H. K. Sarvaiya

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HOD

Applied Mechanics Department

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III(NEW) EXAMINATION – WINTER 2022

Subject Code:3130606 Date:20-02-2023

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)**	Do as directed i Define degree of saturation ii Draw phase diagram for dry soil iii State the equation for relative density.	**03**
	(b)	Derive the relation between void ratio (e), water content (w), specific gravity (G), and degree of saturation.	**04**
	(c)	An undisturbed sample of soil has a volume of 200 cm^3 and mass 395 g. On oven drying for 24 hour the mass reduced to 320 g. If the specific gravity of the grains is 2.64, determine water content, void ratio, and degree of saturation.	**07**
Q.2	**(a)**	A total of 2000 gm of soil is applied the sieve analysis. 1250 gm soil passes from 4.75 mm sieve, and 300 gm soil passes from 75 μ sieve. If D_{10}, D_{30}, and D_{60} values are 0.4, 1.3 and 2.5 respectively. Classify the soil.	**03**
	(b)	Illustrate the process for determination of grain size by Hydrometer	**04**
	(c)	Describe Atterberg limits with proper sketch. Define plasticity index, Consistency index and Liquidity index.	**07**
		OR	
	(c)	Draw the textural classification chart and described the classification process.	**07**
Q.3	**(a)**	Differentiate light weight and heavy weight compaction test.	**03**
	(b)	Describe piston and spring analogy method of consolidation.	**04**
	(c)	A horizontal stratified soil deposits consist of three uniform layer of thickness 6, 4, and 12 m respectively. The permeability of these layers are $8x10^{-4}$ cm/s, $52x10^{-4}$ cm/s, and $6x10^{-4}$ cm/s. Calculate effective average permeability of the deposits if flow is in horizontal direction and vertical direction.	**07**
		OR	
Q.3	**(a)**	Enlist methods of compaction in field and describe any one in detail.	**03**
	(b)	Describe Square root of time fitting for consolidation.	**04**
	(c)	In falling head permeameter test the initial head is 40 cm. The head drops by 5 cm in 10 minutes. Calculate time required to run the test for the final head to be at 20 cm. Take sample 6 cm in height, 50 cm^2 in area and area of stand pipe 0.5 cm^2.	**07**
Q.4	**(a)**	Describe the method to locate the center of critical circle.	**03**
	(b)	Draw the CULMANN's graphical method for active pressure	**04**
	(c)	Two crane line A and B carries load of 60 kN/m and 80 kN/m respectively at a distance 4.0 m. Determine intensity of stress at 2 m below each line and at the center of both line.	**07**

OR

Q.4	**(a)**	Enlist the types of slope failure and explain in detail.	**03**
	(b)	Describe Newmark's Influence chart.	**04**
	(c)	A cylindrical soil sample fails under an axial vertical stress of 160 kN/m^2, when it is laterally unconfined. The failure plane makes an angle of 50° with horizontal. Calculate the value of cohesion and angle of internal friction of the soil.	**07**
Q.5	**(a)**	Derive the equation for active, and passive pressure intensity at the base of retaining wall for cohesionless soil.	**03**
	(b)	Enlist assumption made by Terzaghi to derive bearing capacity equation.	**04**
	(c)	A retaining wall 6 m in height supports cohesionless soil. The unit weight of the soil is 17 kN/m^3, angle of internal friction 30°. The wall also support surcharge 21 kN/m^2. Evaluate pressure intensity at base, horizontal thrust and its point of application.	**07**

OR

Q.5	**(a)**	Derive the equation for depth of tension crake and unsupported height of cohesive soil.	**03**
	(b)	Suggest suitable pile foundations for following soil with reasons. 1. Soft clay 2. Stiff clay	**04**
	(c)	A new canal is excavated to a depth of 5 m, below ground level, through a soil having the following characteristics. C= 14 kN/m^2, Ø = 15°, void ratio 0.8, and G= 2.7. The slope of bank is 1:1. Calculate the factor of safety with respect to cohesion, when canal is running full. If it is suddenly and completely emptied, what will be the factor of safety?	**07**