Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3150615 Date:23-05-2024

Subject Name:Soil Mechanics

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)**	Explain the concept of 'Pressure Bulb' in soils.	**03**
	(b)	Explain shear tests based on drainage condition.	**04**
	(c)	A circular footing 1.5 m radius transmits a uniform pressure of 100 kN/m^2. Calculate vertical stress at point 3 m directly below its centre.	**07**
Q.2	**(a)**	What are the assumptions made in Terzaghi's analysis of bearing capacity of a strip footing?	**03**
	(b)	Write brief critical notes on the Engineering News formula.	**04**
	(c)	A standard penetration test is conducted at a depth of 5 m in saturated fine sand having unit weight 20kN/m^3. If observed N value is 25, then find the corrected N value.	**07**
		OR	
	(c)	Three specimens of clay having a small air void content were tested in the shear box. Shear loading was started immediately after the application of normal load and was completed in 10 minutes. The results obtained were as follows:	**07**

Normal stress (kPa)	145	241	337
Shear stress at failure (kPa)	103	117	132

Find the apparent cohesion and angle of shearing resistance of the clay.

Q.3	**(a)**	Write brief critical notes on unconfined compression test.	**03**
	(b)	Write a short note on Mohr-Coulomb strength theory.	**04**
	(c)	Compute the area ratio of a thin-walled tube sampler having an external diameter of 100 mm and wall thickness of 2 mm. Do you recommend this sampler for obtaining undisturbed soil sample?	**07**
		OR	
Q.3	**(a)**	What is the different application of geotextile, and geocell.	**03**
	(b)	Write brief critical notes on standard penetration test.	**04**
	(c)	A 6 meter deep cut is to be made in cohesive soil with a slope of 1:1. The soil has C_u = 30 kPa, φ_u = 10° & γ = 18 kN/m^3. Find the factor of safety with respect to cohesion. Take stability number, S_n = 0.108.	**07**
Q.4	**(a)**	Write a short note on types of slope failure according to extent of slip surface.	**03**
	(b)	Write a short note on Geophysical exploration using electrical resistivity method.	**04**
	(c)	Two identical specimens of a soil were tested in triaxial apparatus. First specimen failed at a deviator stress of 770 kN/m^2 when the cell pressure was 200 kN/m^2. While the second specimen failed at a deviator stress of 1400 kN/m^2 under a cell pressure of 400 kN/m^2. Determine the shear parameters of the soil.	**07**
		OR	
Q.4	**(a)**	Differentiate between general shear failure and local shear failure.	**03**

	(b)	Explain in brief about any two types of geosynthetics.	**04**
	(c)	Determine the safe bearing capacity of a strip footing 1.5 m wide & 1.5 m depth, resting on a deep sand bed, consider, γ =18 kN/m^3, and bearing capacity factors N_C = 35.5, N_q = 23.2, N_γ = 22 corresponding to ϕ=38˚ and factor of safety = 3.	**07**
Q.5	**(a)**	Describe with a neat sketch how will you carry out the wash boring method of soil exploration.	**03**
	(b)	Explain with figure about contact pressure & settlement distribution beneath rigid & flexible footing.	**04**
	(c)	A concentrated load of 50 kN acts on the surface of a homogeneous soil mass of large extent. Find the stress intensity at a depth of 5m; (a) Directly under the load, and (b) At a horizontal distance of 5m. Use Boussinesq's equation.	**07**

OR

Q.5	**(a)**	What are the basic assumptions in Boussinesq's theory of stress distribution in soils?	**03**
	(b)	Write a short note on different types of shallow foundation.	**04**
	(c)	A 30 cm diameter pile is driven into a homogeneous clay (C = 40 kPa, α = 0.7). If the embedded length is 10 m, estimate the safe load (FS = 2.5).	**07**

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