Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2020

Subject Code:3150615 Date:03/02/2021

Subject Name:Soil Mechanics

Time:10:30 AM TO 12:30 PM Total Marks: 56

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	Discuss various types of slope failures	**03**
	(b)	Differentiate the Infinite and finite slope.	**04**
	(c)	Explain Swedish circle method of stability. analysis	**07**
Q.2	**(a)**	Write and explain Boussinesque's equation.	**03**
	(b)	Explain contact pressure.	**04**
	(c)	Write short note on "New-mark's Influence Chart".	**07**
Q.3	**(a)**	Enlist factor affecting the bearing capacity and explain any one in detail.	**03**
	(b)	Define: 1. Gross pressure intensity 2. Ultimate bearing capacity 3. Safe bearing Capacity 4. Allowable bearing Capacity	**04**
	(c)	Describe plate load test with neat sketch.	**07**
Q.4	**(a)**	Explain a types of pavements.	**03**
	(b)	Differentiate between General shear failure and Local shear failure with neat sketch.	**04**
	(c)	A square footing 2.5 m by 2.5 m is built in a homogeneous bed of sand of unit weight 20kN/m^3 and having an angle of shearing resistance of 36°. The depth of the base of footing is 1.5 m below the ground surface. Calculate the safe load that can be carried by a footing with a factor of safety of 3 against complete shear failure. Use Terzaghi's analysis. Take Nc = 65.4, Nq = 49.4 and $N\gamma$ = 54.	**07**
Q.5	**(a)**	Write the basic principles involved in the geophysical methods of subsurface soil exploration	**03**
	(b)	Explain Bore log in detail.	**04**
	(c)	What are the methods available for sub surface exploration? Explain any one in detail.	**07**
Q.6	**(a)**	Name and explain the shear tests which may be performed based on the different drainage conditions.	**03**
	(b)	Explain importance of 'Unconfined Compression Test'& 'Laboratory Vane Shear Test'.	**04**

	(c)	A standard specimen of cohesionless sand was tested in triaxial compression and the sample failed at a deviator stress of 482 kN/m^2, when the cell pressure was 100 kN/m^2, under drained condition. Find the effective angle of shearing resistance of sand. What would be the deviator stress and the minor principal stress at failure for another identical specimen of sand if it s tested under a cell pressure of 200 kN/m^2?	**07**
Q.7	**(a)**	Enlist a different types of Geosynthetics	**03**
	(b)	Explain functions of Geosynthetics.	**04**
	(c)	In a 16 pile group, the pile diameter is 45 cm and center to center spacing of the square group is 1.5 m. If c = 50 kN/m^2, determine whether the failure would occur with the pile acting individually, or as a group? Neglect bearing at the tip of the pile. All piles are 10 m long. Take m = 0.7 for shear mobilization around each pile.	**07**
Q.8	**(a)**	Explain in detail "Under Reamed Pile Foundation".	**03**
	(b)	How do you estimate the group capacity of piles in sand?	**04**
	(c)	What is negative skin friction? What is its effect on the pile?	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2021

Subject Code:3150615 Date:20/12/2021

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.**

Simple and non-programmable scientific calculators are allowed

Q.1	(a)	Define finite and infinite slopes.	03
	(b)	Explain Culmann's method for stability of slope.	04
	(c)	Write short note on 'Swedish circle method.'	07
Q.2	(a)	Explain the concept of 'Pressure bulb'.	03
	(b)	What do you Under stand by goestatic pressure?	04
	(c)	Determine the factor of safety for a cihesive soil (Ø =0) 8 m high ,with stability number 0.156 .The soil has c= 25kN/m2 and unit weight 18.5 kN/m2..	07
		OR	
	(C)	Explain point to be considered for foundation in black cotton soil.	07
Q.3	(a)	Explain the objectives of subsurface exploration.	03
	(b)	Derive the expression for vertical stress at a point due to live load.	04
	(c)	Explain in detail the construction of Newmark's influence chart. How it is used?	07
		OR	
Q.3	(a)	What do you understand about disturbed and undisturbed soil sample?	03
	(b)	Write about Boring log.	04
	(c)	Describe the standard penetration test. How the observed N-value is corrected.	07
Q.4	(a)	What is Mohr's strength theory.?	03
	(b)	Compare the direct shear test and triaxial compression test.	04
	(c)	Describe triaxial shear test .What are its merits and demerits?	07
		OR	
Q.4	(a)	Explain 'types of the shear failure of soil' with neat sketches.	03
	(b)	Enumerate the facters affecting on bearing capacity and explain in detail.	04
	(c)	Describe plate load test with neat sketches.	07
Q.5	(a)	Describe various types of geosynthetics.	03

(b) Explain methods to reduce foundation settlement. 04

(c) A strip footing 2 m wide is to be laid at a depth 3 m in a purely cohesive soil.c = 100 kN/m2..,γ=18 kN/m3..Determine ultimate bearing capacity from (a) Terzaghi's theory (b) Skempton's theory. 07

OR

Q.5 (a) What is negetive skin friction? What is its effect on pile? 03

(b) Explain group action of pile group. 04

(c) Discuss various dynamic formulae for pile. What are their limitations? 07

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2021

Subject Code:3150615 Date:17/09/2021

Subject Name:Soil Mechanics

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)**	Describe the standard penetration test. In what way is it useful in foundation design?	**03**
	(b)	An embankment is inclined at an angle of 35° and its height is 15 m. the angle of shearing resistance is 15° and the cohesion intercept is 200 kN /m^2. The unit weight of soil is 18 kN/m^3. If Taylor's stability number is 0.06, find the factor of safety with respect to cohesion.	**04**
	(c)	Explain briefly, the step-by step procedure for selecting a proper, appropriate and final choice of foundation for a given structure	**07**
Q.2	**(a)**	What are the various steps considered in the planning of sub-surface exploration programe?	**03**
	(b)	A Concentrated load of 22.5KN acts on the surface of a homogeneous soil mass of large extent. Find the stress intensity at a depth of 15 meters and (i) direct under the load, and (ii) at a horizontal distance of 7.5 meters. Use Boussiones's equations.	**04**
	(c)	Describe a suitable method of stability analysis of slopes in (i) purely saturated cohesive soil, (ii) cohesionless sand.	**07**
		OR	
	(c)	A square group of 9 piles was driven into soft clay extending to a large depth. The diameter and length of the piles were 30 cm and 9m respectively. If the unconfined compression strength of the clay is 90 kN/m^2, and the piles spacing is 90 cm center to center, what is the capacity of the ground? Assume a factor of safety of 2.5 an adhesion factor of 0.75.	**07**
Q.3	**(a)**	Define (a) pressure bulb (b) Influence Value (C) isobar	**03**
	(b)	Derived the principal of construction of Newmark's chart and explain its use.	**04**
	(c)	What are the basic assumptions in Boussinesq's theory of stress distribution in soils? Show the vertical stress distribution on horizontal plan at s given depth and also the vertical stress distribution with depth.	**07**
		OR	
Q.3	**(a)**	Differentiate between infinite and finite slopes.	**03**
	(b)	A group of 16 piles of 50 cm diameter is arranged with a centre to center spacing of 1 m the piles are 9m long and are embedded in soft clay with cohesion 30 kN /m^2 bearing resistance may be neglected for the piles Adhesion factor is 0.6. Determine the ultimate load capacity of the pile group.	**04**
	(c)	Give a method to determine the bearing capacity of a pile in clay soil. What is group effect and how will you estimate the capacity of a pile group in clay?	**07**

Q.4	**(a)**	Explain in detail various applications of geosynthetics.	**03**
	(b)	Explain different types of factor of safety used in the stability analysis of slopes.	**04**
	(c)	In an unconfined compression test, a sample of sandy clay 8 cm long and 4 cm in diameter fails under a load of 120 N at 10% strain. Compute the shearing resistance taking into account the effect of change in cross-section of the sample.	**07**

OR

Q.4	**(a)**	A pile is driven in uniform clay of large depth. The clay has unconfined compression strength of 90 kN/m^2. The pile is 30 cm diameter and 6m long. Determine the safe frictional resistance of the pil, assuming a factor of safety of 3. Assume the adhesion factor $\alpha = 0.7$	**03**
	(b)	What is a 'raft foundation'? When is it preferred?	**04**
	(c)	Explain the basic difference in the bearing capacity computation of shallow and deep foundations. How are skin frictions and point resistance of a pile computed?	**07**
Q.5	**(a)**	What is the effect of pore pressure in strength of soils?	**03**
	(b)	Explain the principle of the direct shear test. What are its limitations?	**04**
	(c)	Compute the ultimate load that an eccentrically loaded square footing of width 2.1 m with an eccentricity of 0.35 m can take at a depth of 0.5 m in a soil with $\Upsilon=18\ kN/m^3$ $C=9\ kN/m^2$ and $\varphi = 36°$, $N_c=52$, $N_q=35$, and $N_y=42$.	**07**

OR

Q.5	**(a)**	Write an explanatory note on the general types of foundations.	**03**
	(b)	Explain the basic differences between a box shear test and a triaxial shear test for soils.	**04**
	(c)	Derive an expression for vertical stress under a point load.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V(NEW) EXAMINATION – SUMMER 2022

Subject Code:3150615 Date:13/06/2022

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)**	Describe Various types of Failure with sketch.	**03**
	(b)	What do you mean by site investigation? What are the different purposes of site investigation?	**04**
	(c)	Write step by step procedure to perform standard penetration test in the field. Also explain corrections for SPT value?	**07**
Q.2	**(a)**	Enlist different types of factor of safety used in stability of slopes.	**03**
	(b)	Define following terms in relation to tri-axial test (i) Confining pressure (ii) Deviator stress (iii) major and minor principal stress	**04**
	(c)	An Embankment 13 m high is inclined at 30^0 to the horizontal. A stability analysis by the method of slice gives the following forces per running meter. Sum of shearing forces = 600 kN. Sum of Normal forces = 1000 kN. Sum of neutral forces= 200 kN. The length of arc is 35 m. the value of effective stress parameter are 30 kN/m^2 and 25^0 resp. Determine the FOS w.r.t. (a) shearing strength (b) Cohesion.	**07**
		OR	
	(c)	How a slope is analyzed using Swedish circle method? Derive an expression for factor of safety.	**07**
Q.3	**(a)**	What are the advantages and disadvantages of Tri-axial Compression Test?	**03**
	(b)	Define negative skin friction. What is its effect on the pile?	**04**
	(c)	Two identical specimens 3.8 cm in dia. and 7.6 cm height were tested in tri-axial test under un-drained conditions. The first specimen failed at an axial load of 75 kg under a cell pressure of 1 kg/cm^2. The second specimen failed at on axial load of 95 kg under a cell pressure of 2 kg/cm2. Determine the value of cohesion and angle of shearing resistance.	**07**
		OR	
Q.3	**(a)**	Write short note on Newmark's influence chart.	**03**
	(b)	Describe Terzaghi's theory of bearing capacity of foundation soil under strip footing. What are the assumptions and its limitations?	**04**
	(c)	What is Unconfined compression test? Explain the procedure with neat sketch and write its advantages over a tri-axial test.	**07**

Q.4	**(a)**	Write short note on Floating Foundation.	**03**
	(b)	Enumerate factor affecting bearing capacity of soil .	**04**
	(c)	A 2.5 m wide strip footing is founded at a depth of 2.0 m below the ground level in a homogeneous bed of sand , having the following properties: Φ= 35º, γ = 18.0 kN/m^3. Determine the ultimate, net ultimate and net safe bearing capacity of the footing. For Φ= 35º Nc= 57.8, Nq= 41.4,Nγ = 42.4. Assume a factor of safety of 3.0 Use Terazaghi's analysis. Water table is at 2 m from G.L.	**07**

OR

Q.4	**(a)**	Differentiate between general shear failure and local shear failure.	**03**
	(b)	Explain how expansive soil can be identified in the laboratory?	**04**
	(c)	Determine the safe bearing capacity of a square footing 2.0 m x 2.0 m located at a depth of 1 m below ground level in a soil of density 17.5 kN/m3 , Φ= 30º (Nc= 30.4, Nq= 18.4, Nγ = 22.4) if the water table rises upto G.L. what is reduction in SBC. Take FOS=3.	**07**

Q.5	**(a)**	Enlist different pile driving hammers. Explain any two in detail.	**03**
	(b)	Write Short note on Under reamed pile.	**04**
	(c)	A group of 16 piles of 0.45 m diameter is arranged in a square pattern with centre to centre spacing of 1.5 m. The piles are 10 m long and embedded in soft clay with cohesion 30 kN/m². Bearing resistance may be neglected for the piles. Adhesion factor is 0.6. Determine the ultimate load capacity of pile group.	**07**

OR

Q.5	**(a)**	Write dynamic formulae to estimate pile capacity.	**03**
	(b)	Classify geo-textile materials. What are the basic functions performed by geotextiles?	**04**
	(c)	A concrete pile, 35 cm diameter, 15 m long is driven through a 6 m thick layer of silty sand (ϕ=25,γ =18 kN/m3)overlaying a dense layer of sand (ϕ=40, γ =16.5 kN/m3). If the water table is at great depth, estimate the safe load the pile can carry Take F.S. =3, k=1.0, and δ=0.75ϕ. (Nq= 140 for ϕ=40)	**07**

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