GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– III (New) EXAMINATION – WINTER 2019

Subject Code: 3130606   **Date: 26/11/2019**

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.**

Q.1	**(a)**	Explain briefly with diagram Geological Cycle.	**03**
	(b)	What is the scope of geotechnical engineering in the field of civil Engineering?	**04**
	(c)	Define the following terms: (i) water content (ii) void ratio (iii) porosity (iv) Unit weight of solids (v) Air content (vi) Bulk Unit weight (vii)Specific gravity	**07**
Q.2	**(a)**	What are the purposes of the soil classification?	**03**
	(b)	Explain the various factors affecting compaction.	**04**
	(c)	A soil sample has a porosity of 40 percent. The specific gravity of solids is 2.70. Calculate (a) void ratio, (b) dry density, (c) unit weight if the soil is 50% saturated and (d) unit weight if the soil is completely saturated.	**07**

OR

	(c)	The following are the result of the standard compaction test:-	**07**

Water content (%)	05	10	14	20	25
Bulk density (kN/m³)	17.5	19.5	21	22	21.5

Plot the MDD-OMC curve and obtain the optimum water content and maximum dry density.

Q.3	**(a)**	Explain briefly each factor affecting permeability of soils.	**03**
	(b)	Define term consolidation Explain with sketch Terzaghi's One Dimensional Consolidation using Spring Analogy	**04**
	(c)	Define with sketch Flow net. Its characteristics and its application.	**07**

OR

Q.3	**(a)**	Differentiate between standard proctor and modified proctor test.	**03**

(b) Differentiate between the process of consolidation and compaction. **04**

(c) Define Coefficient of compressibility, Coefficient of Volume change, Compression Index.
During consolidation test, the void ratio is determined to decrease from 0.80 to 0.40 under the stress increment of 100 kPa to 250 kPa. Compute coefficient of compressibility, coefficient of volume compressibility & compression index. **07**

Q.4 **(a)** Differentiate between active and passive earth pressure with relevant examples. **03**

(b) Explain Rankine's earth pressure theory for determination of lateral earth pressure under different conditions? **04**

(c) Explain Newmark's Chart and its application. **07**

OR

Q.4 **(a)** Differentiate between General shear failure and Local shear failure with neat sketch. **03**

(b) Differentiate between Direct Shear Box and Triaxial Test. **04**

(c) Write a short note on 'soil water' and 'soil structure'. Also explain about commonly observed soil structures. **07**

Q.5 **(a)** Enlist factor affecting the bearing capacity and explain anytwo in detail. **03**

(b) Explain Modified Mohr Coulomb failure theory for shear strength? Sketch typical strength envelop for different type of soil. **04**

(c) What are the three standard triaxial shear tests with respect todrainage conditions? Explain with reasons the situations for whicheach test is to be preferred. **07**

OR

Q.5 **(a)** What are different factors of safety used in the stability of slopes? Discuss briefly. **03**

(b) Discuss briefly, different types of slope failures. **04**

(c) Define Safe, Allowable and Ultimate bearing capacity of soil. Write down Taraghi's bearing capacity equation, its assumption and limitation of analysis. **07**

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–III (NEW) EXAMINATION – WINTER 2020

Subject Code:3130606   **Date:09/03/2021**
Subject Name:Geotechnical Engineering
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.**

Q.1	**(a)**	What are the three phase of soil?	**03**
	(b)	What is the scope of geotechnical engineering in the field of civil engineering	**04**
	(c)	Derive the following relationship: Yd= G Yw / 1 +e.	**07**
Q.2	**(a)**	Explain grain size distribution by sieve analysis.	**03**
	(b)	Define: 1.Toughness Index, 2.Thixotrophy.	**04**
	(c)	What are different types of soil structure which can occur in nature? Describe in brief.	**07**
Q.3	**(a)**	What is negative skin friction ? What is its effect on the pile ?	**03**
	(b)	Discuss the IS classification system of soil.	**04**
	(c)	What is quick sand condition ? How would you calculate the hydraulic gradient required to create quick sand conditions in a sample of sand?	**07**
Q.4	**(a)**	What are the different methods of compaction adopted in the field?	**03**
	(b)	Describe the spring analogy for primary consolidation	**04**
	(c)	Differentiate between compaction and consolidation.	**07**
Q.5	**(a)**	Write different Shear tests based on Drainage conditions.	**03**
	(b)	Explain Modified Mohr-Coulomb theory.	**04**
	(c)	Explain in detail the construction of Newmark's influence chart. How is it used ?	**07**
Q.6	**(a)**	Distinguish between active earth pressure and passive earth pressure.	**03**
	(b)	Determine the factor of safety against sliding for slip surface passing through the toe of a finite slope of height of 11m and slope angle 1V:1H has c= 15kPa, $\emptyset = 32^0$,γ_t =18 kN/m^3.The radius and the central angle of slip circle is 17.4m and 87^0 respectively. Take ΣN = 1902.74kN and ΣT= 941.15 kN .Use Swedish circle method.	**04**
	(c)	Explain Rankine theory for active earth pressure in cohesive soil.	**07**
Q.7	**(a)**	What are different types of slope failures?	**03**
	(b)	Write short note on Swedish circle method.	**04**
	(c)	A retaining wall of height 8.0m has a horizontal sandy soil as a backfill (C= 0.0, $\emptyset = 30^0$,γ_t =18kN/m^3) A surcharge of 50 kPa is acting over the backfill. Draw the active pressure distribution and calculate the total active thrust acting on the wall.	**07**
Q.8	**(a)**	State different types of shallow foundation.	**03**

(b) Enumerate the factors affecting bearing capacity and explain in detail. **04**

(c) Describe plate load test with neat sketches. **07**

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III (NEW) EXAMINATION – WINTER 2021

Subject Code:3130606   **Date:17-02-2022**

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)** Explain the purposes of the soil classification	**03**
	(b) What is the scope of geotechnical engineering in the various domain of civil Engineering?	**04**
	(c) Explain three phase of soil. Also write note on soil formation in Geological cycle. (with sketch)	**07**
Q.2	**(a)** Explain particle size distribution and its application.	**03**
	(b) Define the following terms: (i) water content (ii) void ratio (iii) porosity (iv) degree of saturation (v) specific gravity	**04**
	(c) Define consistency of soil? Explain with sketch various methods to determine it.	**07**

OR

	(c) An undisturbed soil sample has total weight of 2060 gm, volume of 1200 cc, water content = 11% and specific gravity G = 2.68. Compute (i) void ratio (ii) porosity (iii) degree of saturation (iv) water content to make sample fully saturated and (v) effective unit weight of the soil sample.	**07**

Q.3	**(a)** Distinguish between free water and held water.	**03**
	(b) Differentiate between light compaction test and heavy compaction test.	**04**
	(c) The following results were obtained in a standard compaction test on a soil sample.	**07**

Water content %	5	10	20	14	25
Bulk unit weight kN/m^3	17.7	19.8	21.0	21.8	21.6

Determine the OMC and MDD of this soil. Also calculate water necessary to completely saturated the sample at its maximum dry unit weight assuming no change in volume take G = 2.7

OR

Q.3	**(a)** Difference between shallow and deep foundation	**03**
	(b) Explain briefly each factor affecting permeability of soils.	**04**
	(c) Define with sketch Flow net. Its characteristics and its application.	**07**

Q.4	**(a)**	Discuss briefly, different types of slope failures.	**03**
	(b)	Enlist factor affecting the bearing capacity and explain any two in detail	**04**
	(c)	Define Safe, Allowable and Ultimate bearing capacity of soil. Write down Terzaghi's bearing capacity equation, its assumption and limitation of analysis.	**07**

OR

Q.4	**(a)**	Define Coefficient of compressibility, Coefficient of Volume change, Compression Index.	**03**
	(b)	Differentiate between the process of consolidation and compaction.	**04**
	(c)	Enlist the three standard triaxial shear tests with respect to drainage conditions? Explain with reasons the situations for which each test is to be preferred.	**07**

Q.5	**(a)**	Differentiate between active and passive earth pressure with relevant examples.	**03**
	(b)	Explain Modified Mohr Coulomb failure theory for shear strength? Sketch typical strength envelop for different type of soil.	**04**
	(c)	Explain plate load test with neat sketches. It's application.	**07**

OR

Q.5	**(a)**	Explain with nest sketch working principle of Vane shear test.	**03**
	(b)	Differentiate between General shear failure and Local shear failure with neat sketch	**04**
	(c)	Explain Newmark's Chart and its application.	**07**

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– III EXAMINATION – SUMMER 2020

Subject Code: 3130606   **Date:27/10/2020**

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.**

Q.1	**(a)**	Explain briefly with diagram Geological Cycle.	03
	(b)	What is the scope of geotechnical engineering in the field of civil Engineering?	04
	(c)	Define the following terms: (i) water content (ii) void ratio (iii) porosity (iv) Unit weight of solids (v) Air content (vi) Bulk Unit weight (vii)Specific gravity	07
Q.2	**(a)**	What are the purposes of the soil classification?	03
	(b)	Explain the various factors affecting compaction.	04
	(c)	A soil sample has a porosity of percent. The specific gravity of solids is 2.65. Calculate (a) void ratio, (b) dry density, (c) unit weight if the soil is 60% saturated and (d) unit weight if the soil is completely saturated.	07
		OR	
	(c)	The following are the result of the standard compaction test: - Water content (%): 05 ,10, 15, 20, 25 Bulk density (kN/m^3): 16.5, 20.5, 21, 22, 21.8 Plot the MDD-OMC curve and obtain the optimum water content and maximum dry density.	07
Q.3	**(a)**	Explain briefly each factor affecting permeability of soils.	03
	(b)	Define term consolidation Explain with sketch Terzaghi's One Dimensional Consolidation using Spring Analogy	04
	(c)	Define with sketch Flow net. Its characteristics and its application.	07
		OR	
Q.3	**(a)**	Differentiate between standard proctor and modified proctor test.	03
	(b)	Differentiate between the process of consolidation and compaction.	04
	(c)	Define Coefficient of compressibility, Coefficient of Volume change, Compression Index. During consolidation test, the void ratio is determined to decrease from 0.60 to 0.20 under the stress increment of 200 kPa to 350 kPa. Compute coefficient of compressibility, coefficient of volume compressibility & compression index.	07
Q.4	**(a)**	Differentiate between active and passive earth pressure with relevant examples.	03
	(b)	Explain Rankine's earth pressure theory for determination of lateral earth pressure under different conditions?	04
	(c)	Explain Newmark's Chart and its application.	07
		OR	
Q.4	**(a)**	Differentiate between General shear failure and Local shear failure with neat sketch.	03

	(b)	Differentiate between Direct Shear Box and Triaxial Test.	04
	(c)	Write a short note on 'soil water' and 'soil structure'. Also explain about commonly observed soil structures.	07
Q.5	**(a)**	Enlist factor affecting the bearing capacity and explain any two in detail.	03
	(b)	Explain Modified Mohr Coulomb failure theory for shear strength? Sketch typical strength envelop for different type of soil.	04
	(c)	What are the three standard triaxial shear tests with respect to drainage conditions? Explain with reasons the situations for which each test is to be preferred.	07

OR

Q.5	**(a)**	What are different factors of safety used in the stability of slopes? Discuss briefly.	03
	(b)	Discuss briefly, different types of slope failures.	04
	(c)	Define Safe, Allowable and Ultimate bearing capacity of soil. Write down Taraghi's bearing capacity equation, its assumption and limitation of analysis.	07

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2021

Subject Code:3130606 **Date:06/09/2021**
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.**

Q.1	**(a)** Explain three phase of soil.	**03**
	(b) Explain soil formation in Geological cycle.	**04**
	(c) What is the scope of geotech engineering in the field of civil engineering?	**07**
Q.2	**(a)** What is particle size distribution?	**03**
	(b) A soil has a water content of 10% and a unit weight of 20 kN/m^3. If the gravity of soil mass is 2.70, determine the dry unit weight , void ratio and degree of saturation.	**04**
	(c) What do you mean by consistency of soil? How is it determined?	**07**
	OR	
	(c) Explain the grain size distribution by using sieve analysis method.	**07**
Q.3	**(a)** What is platicity index?	**03**
	(b) Discuss the IS classification system.	**04**
	(c) State and explain factors affecting permeability.	**07**
	OR	
Q.3	**(a)** Distinguinsh between free water and held water.	**03**
	(b) Describe the spring analogy for primary consolidation .	**04**
	(c) Ennumerate the factors affecting bearing capacity and explain in detail.	**07**
Q.4	**(a)** Describe triaxial shear test..	**03**
	(b) In a consolidted drained triaxial test , a specimen of claybfails at a cell pressure of 60 kN/m^2. The effective shear parameters are C' = 15 kN/m^2 ,and Ø'= 20^0 , Determine the compressive strength.	**04**
	(c) What is Mohr's strength theory? Sketch typical strength envelope for a clean sand	**07**

OR

Q.4   **(a)** What are the different types of earth pressure? Give examples.   **03**

      (b) Write short note on Earth pressure at rest.   **04**

      (c) Discuss the assumption in the Rankine's theory of earth pressure.   **07**

Q.5   **(a)** Discribe the method of locating centre of critical slip circle.   **03**

      (b) What are the different types of the slope failure?   **04**

      (c) Write a short note on 'Swedish circle method'.   **07**

OR

Q.5   **(a)** State different types of the shallow foundation.Explain any one with
neat sketch.   **03**

      (b) Write short note on group action and efficiency of pile group.   **04**

      (c) Describe plate load test with naet sketches.   **07**

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– III (NEW) EXAMINATION – SUMMER 2022

Subject Code:3130606   **Date:11-07-2022**

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)**	Explain briefly with diagram Geological Cycle	**03**
	(b)	Differentiate between flocculated and honey comb structure.	**04**
	(c)	Describe the method of liquid limit of soil by Casagrande method.	**07**
Q.2	**(a)**	Distinguish between light compaction and heavy compaction.	**03**
	(b)	Explain the various factors affecting compaction.	**04**
	(c)	Enlist and explain any one method of compaction.	**07**

OR

	(c)	What is particle size distribution curve? What is its use in soil engineering?	

Q.3	**(a)**	Explain briefly each factor affecting permeability of soils	**03**
	(b)	Explain in detail the construction of Newmark's influence chart	**04**
	(c)	Define with sketch Flow net. Its characteristics and its application.	**07**

OR

Q.3	**(a)**	Define finite and infinite slopes with example.	**03**
	(b)	Discuss briefly, different types of slope failures.	**04**
	(c)	Derive an expression for the factor of safety of an infinite slope in a cohesionless soil. What is the effect of steady seepage parallel to the slope on a stability?	**07**

Q.4	**(a)**	What is Mohr's strength theory for soils? Sketch typical strength envelop for a clean sand.	**03**
	(b)	Draw Coulomb's failure envelop for sandy soil, clay soil and mix soil.	**04**
	(c)	Describe direct shear test. What are the advantages of this test? What are its limitations?	**07**

OR

Q.4	**(a)**	Distinguish between 'active' and 'passive' earth pressure.	**03**
	(b)	A retaining wall 6m height with vertical back supports cohesive soil backfill having unit weight 20 kN/m^3 and angle of internal friction as zero. Calculate	**04**

      i)   Internal Pressure intensity at top
      ii)   Depth of tension crack
      iii)   Lateral pressure intensity at the base.

	(c)	Explain Culmann's graphical methods for active earth pressure.	**07**

Q.5	**(a)**	Define consolidation. What are its causes?	**03**
	(b)	Define the terms:	**04**

      i)   Compression index
      ii)   Coefficient of volume change
      iii)   Coefficient of compressibility

Also indicate their units and symbols

(c) In a laboratory a 2 cm thick soil sample takes 25 minutes to reach 30% degree of consolidation. Find the time required for a 5 m thick clay layer in the field to reach 40 % consolidation. Assume double drainage in both the cases. **07**

OR

Q.5 (a) Enlist factor affecting the bearing capacity and explain any two in detail. **03**

(b) Explain type of shear failure of soil with net sketch. **04**

(c) Define Safe, Allowable and Ultimate bearing capacity of soil. Write down Taraghi's bearing capacity equation, its assumption and limitation of analysis. **07**

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