

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III (NEW) EXAMINATION – SUMMER 2024****Subject Code:3130606****Date:16-07-2024****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 terms. **03**
1. Void ratio
 2. Degree of saturation
 3. Water content
- (b) Derive the relation between $\gamma_b = \frac{(G+se)\gamma_w}{(1+e)}$ **04**
- (c) A soil sample has porosity of 45%, with specific gravity 2.7. Calculate (A) void ratio (B) dry density (C) unit weight of soil if soil is fully saturated. **07**
- Q.2** (a) In the sieve analysis test 60% soil retains on 4.75 mm sieve. If the value of $D_{10}=0.115$, $D_{30}=0.53$, and $D_{60}=1.55$ respectively, classify the soil. **03**
- (b) Illustrate the hydrometer test for grain size analysis of fine grain soil. **04**
- (c) Describe laboratory falling head permeability test. **07**
- OR**
- (c) Describe laboratory standard proctor test. **07**
- Q.3** (a) Differentiate between UU and CU test. **03**
- (b) Describe honeycombed structure of soil. **04**
- (c) A sample of dry cohesionless soil was tested in a triaxial test at confining pressure of 100 kN/m². If the angle of shearing resistance was 36°, determine the deviator stress. **07**
- OR**
- Q.3** (a) State the limitations of Direct shear test **03**
- (b) Describe flocculated structure of soil. **04**
- (c) A cylindrical soil sample failed at 140 kN/m² in an unconfined compression test. The failure plane makes an angle of 54° with horizontal. Determine the shear parameters. **07**
- Q.4** (a) Describe friction circle method. **03**
- (b) Illustrate Isobar diagram. **04**
- (c) A retaining wall with vertical back and 6.0 m in height supports cohesionless soil up to full heights. It also carries udl of 27 kN/m². If the unit weight of soil is 17.5 kN/m³, and angle of internal friction is 30°, calculate pressure intensity at base, total horizontal thrust with its location. **07**
- OR**
- Q.4** (a) Describe Swedish circle method. **03**
- (b) Illustrate NEWMARK'S influence chart. **04**
- (c) A 5 m high retaining wall supports cohesive soil. The soil properties are $c = 5$ kN/m², $\gamma = 17$ kN/m³, and $\phi = 30^\circ$. Determine pressure at top, depth of tension crack, unsupported height, and pressure intensity at base. **07**

- Q.5** (a) Differentiate between General and Local shear failure. **03**
(b) Provide detail classification of pile. **04**
(c) Enlist assumption made by the Terzaghi in the theory of consolidation. **07**
- OR**
- Q.5** (a) State the effects of water table on bearing capacity of soil. **03**
(b) Differentiate between End bearing pile and friction pile. **04**
(c) Describe spring analogy methods for consolidation. **07**

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GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III(NEW) EXAMINATION – SUMMER 2023****Subject Code:3130606****Date:24-07-2023****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) 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) Explain the purposes of the soil classification	03
(b) Explain the various factors affecting compaction.	04
(c) Explain the grain size distribution by using sieve analysis method in details and its outcomes. How to determine C_c and C_u ?	07
OR	
(c) An undisturbed soil sample has total weight of 2060 gm, volume of 1200cc. 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 weight of soil sample	07
Q.3 (a) Differentiate between standard proctor and modified proctor test.	03
(b) Explain briefly each factor affecting permeability of soils.	04
(c) Define with sketch Flow Net. Its characteristics and its application.	07
OR	
Q.3 (a) Differentiate between the process of consolidation and compaction.	03
(b) Enlist different methods for classification of soil. Explain any one in detail.	04

- (c) The following are data from laboratory light compaction Determine MDD and OMC by drawing compaction graph. **07**

Water Content (%)	Bulk Density (g/cc)
17.5	1.87
19.0	1.95
20.0	1.97
21.0	1.98
22.0	1.99
22.5	1.97
24.0	1.96

- Q.4** (a) Differentiate between active and passive earth pressure with relevant examples. **03**
 (b) Differentiate between General shear failure and Local shear failure with neat sketch. **04**
 (c) Explain Newmark's Chart and its application. **07**

OR

- Q.4** (a) Define term consolidation Explain with sketch Terzaghi's One Dimensional Consolidation using Spring Analogy **03**
 (b) What is Mohr's Coulomb's shear strength theory? Sketch typical strength envelope for a clean sand **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**

- Q.5** (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.5** (a) Write critically note on Pile classification **03**
 (b) Explain plate load test with neat sketches. It's application. **04**
 (c) Briefly explain Direct Shear Box and Triaxial Test. **07**

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.
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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 Terzaghi's bearing capacity equation, its assumption and limitation of analysis. **07**
