Q.6	i.	Discuss the various types of Geosynthetics materials.	**3**	2	1	2	1
	ii.	What do you understand by reinforced earth? Enumerate various applications of reinforced earth.	**7**	3	2	4	2
OR	iii.	Illustrate the practical applications of geotextiles with an accompanying sketch.	**7**	3	2	4	2

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering
End Sem Examination Dec 2024
CE3ET09 Ground Improvement Techniques

Programme: B.Tech. Branch/Specialisation: CE

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	**BL**	**PO**	**CO**	**PSO**
Q.1	i.	What is the primary purpose of ground improvement techniques in civil engineering? (a) To enhance soil properties for supporting structures (b) To improve soil fertility for farming (c) To prevent soil erosion only (d) To improve the aesthetic appearance of the ground	**1**	1	1	1	1
	ii.	Using soil stabilization techniques, the following parameter of pavement construction can be reduced: (a) Time (b) Material (c) Cost (d) Labour	**1**	1	2	1	2
	iii.	The properties of a soil under compaction depend upon: (a) Swelling (b) Placement condition (c) Water content (d) Permeability	**1**	1	1	1	1
	iv.	The important factors that govern the engineering behavior of soil are: (a) Densification (b) Stabilisation (c) Tensile strength (d) Particle size distribution	**1**	2	2	2	2

v.	Cement stabilization cannot be used in which of the below soil types: (a) Granular (b) Silty (c) Lean clay (d) Organic	**1**	1	1	1	1
vi.	What is the name of the point when the plastic limit starts decreasing on increasing lime content? (a) Plastic lime point (b) Lime stabilized point (c) Plastic reduction point (d) Lime fixation point	**1**	2	2	2	1
vii.	Which ground improvement technique would be the best fit to deal with loose granular soils: (a) Preloading (b) Lime stabilization (c) Vertical drains (d) Vibro-compaction	**1**	2	2	2	2
viii.	What is the major advantage of using dynamic compaction as a ground improvement technique? (a) It increases the organic content of the soil (b) It does not require any specialized tools or machinery (c) It is effective for treating large areas (d) It is the least expensive method	**1**	1	1	1	1
ix.	Following geosynthetic material can be considered as a three-dimensional grid that can be used to confine unbound low cohesion materials: (a) Geodim (b) Geocell (c) Geoplane (d) Geocone	**1**	2	3	2	2
x.	The geosynthetic clay liners are made with geotextile and which type of following clay mineral: (a) Bentonite (b) Kaolinite (c) Montmorillonite (d) Illite	**1**	1	1	1	1

Q.2	i.	What are the various engineering challenges associated with soils? What ground improvement techniques can be applied to address them?	**4**	2	1	2	2
	ii.	How are different ground improvement techniques classified?	**6**	3	2	3	2
OR	iii.	Discuss the suitability, feasibility and desirability of various ground improvement techniques.	**6**	3	2	3	2
Q.3	i.	Explain the concept of mechanical stabilization of soil.	**2**	2	1	2	1
	ii.	Discuss the advantages of compaction.	**3**	2	1	2	1
	iii.	What is the difference between standard compaction and modified compaction?	**5**	3	2	3	2
OR	iv.	Briefly describe how the line of optimum moisture is determined during a laboratory compaction test.	**5**	3	2	3	2
Q.4	i.	Describe the principles and applications of soil-lime stabilization techniques.	**4**	2	2	2	2
	ii.	What are the chemical reactions that take place during the chemical stabilization of soil? Explain their effects.	**6**	3	2	3	2
OR	iii.	What factors affect the improvement of strength and stiffness in cement-treated soils?	**6**	3	2	3	2
Q.5		Attempt any two:					
	i.	Discuss in detail the benefits of using vertical drains in conjunction with preloading techniques.	**5**	3	2	3	2
	ii.	Explain the concept of compaction grouting, including its advantages and disadvantages.	**5**	3	2	3	2
	iii.	Describe the electro-osmotic method of dewatering and its significance in ground improvement.	**5**	3	2	3	2

Marking Scheme

CE3ET09 Ground Improvement Techniques

Q.1 i) What is the primary purpose of ground improvement techniques in civil engineering: **1**

a) To enhance soil properties for supporting

ii) Using soil stabilization techniques, the following parameter of pavement construction can be reduced: **1**

c) Cost

iii) The properties of a soil under compaction depend upon: **1**

c) Water content

iv) The important factors that govern the engineering behavior of soil are: **1**

d) Particle size distribution

v) Cement stabilization cannot be used in which of the below soil types: **1**

d) Organic

vi) What is the name of the point when the plastic limit starts decreasing on increasing lime content: **1**

d) Lime fixation point

vii) Which ground improvement technique would be the best fit to deal with loose granular soils: **1**

d) Vibro-compaction

viii) What is the major advantage of using dynamic compaction as a ground improvement technique: **1**

c) It is effective for treating large areas

ix) Following geosynthetic material can be considered as a three-dimensional grid that can be used to confine unbound low cohesion materials: **1**

b) Geocell

x) The geosynthetic clay liners are made with geotextile and which type of following clay mineral: **1**

a) Bentonite

Q.2 i. What are the various engineering challenges associated with soils, and what ground improvement techniques can be applied to address them? **4**

Explanation of various challenges: 2 Marks (0.5 Each)
Relevant Ground Improvement techniques: 2 Marks

ii. How are different ground improvement techniques classified? **6**

Classification: 6 Marks (1.5 Marks Each)

OR iii. Discuss the suitability, feasibility and desirability of various ground improvement techniques. **6**

Suitability, Feasibility and Desirability:
6 Marks (2 Marks Each)

Q.3 i. Explain the concept of mechanical stabilization of soil? **2**

Explanation: 2 Marks

ii. Discuss the advantages of compaction? **3**

Advantages: 3 Marks (0.5 Marks Each)

iii. What is the difference between standard compaction and modified compaction? **5**

Differentiation: 5 Marks (01 Mark Each)

OR iv. Briefly describe how the line of optimum moisture is determined during a laboratory compaction test. **5**

Explanation & Procedure: 04 Marks
Compaction Chart: 01 Marks

Q.4 i. Describe the principles and applications of soil-lime stabilization techniques. **4**

Principles: 02 Marks
Application: 02 Marks

ii. What are the chemical reactions that take place during the chemical stabilization of soil and explain their effects. **6**

Reactions equations with name: 02 Marks (01 Each)
Explanation: 4 Marks

OR iii. What factors affect the improvement of strength and stiffness in cement-treated soils? **6**

Explanation of Various Factors:
6 Marks (1.5 Marks Each)

Attempt any two:

Q.5 i. Discuss in detail the benefits of using vertical drains in conjunction with preloading techniques. **5**

Preloading Techniques Concept: 2 Marks
Benefits of Vertical drain in application of preloading: 3 Marks

ii. Explain the concept of compaction grouting, including its advantages and disadvantages. **5**

Explanation of Compaction Grouting: 2 Marks
Advantages & Disadvantages: 3 Marks (1.5 Each)

iii. Describe the electro-osmotic method of dewatering and its significance in ground improvement. **5**

Description of Method: 3 Marks
Significance: 2 Marks

Q.6 i. Discuss the various types of Geosynthetics Materials? **3**

Various Types: 3 Marks (0.5 Marks Each)

ii. What do you understand by reinforced earth? Enumerate various applications of reinforced earth. **7**

Reinforced Earth Concept: 3 Marks
Application: 4 Marks (2 Marks Each)

OR iii. Illustrate the practical applications of geotextiles with an accompanying sketch. **7**

Applications: 6 Marks (1 Mark Each)
Neat Sketches in application: 01 Mark

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