

Hall Ticket No

Question Paper Code: ACE509



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## MODEL QUESTION PAPER

B. Tech VII Semester End Examinations, November - 2019

Regulations: R16

### GROUND IMPROVEMENT TECHNIQUES

(CIVIL ENGINEERING)

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

#### UNIT – I

1. a) Explain in detail physical and chemical modification techniques along with their applications? [7M]
- b) Explain in detail thermal modification techniques along with their merits and demerits? [7M]
2. a) What are the various geotechnical problems faced with black cotton soil, laterite soil and alluvial soil deposits? [7M]
- b) What are the various laboratory and field tests to characterize problematic soils? Explain them in detail? [7M]

#### UNIT – II

3. a) What are compaction piles? Discuss the installation procedure of compaction piles. [7M]
- b) What is stone column? What are the methods of installing a stone column? [7M]
4. a) Explain in detail the method of dynamic compaction of cohesion less soil [7M]
- b) Explain in detail with a neat diagram the method of dynamic tamping? [7M]

#### UNIT – III

5. a) Explain in brief the principle, equipment used, installation and operation adopted in electro-osmotic dewatering. [7M]
- b) Write the various methods of preloading adopted in ground improvement technique. [7M]
6. a) Compare the various dewatering systems suitability, uses, merits and demerit. [7M]
- b) Explain in detail with a neat sketch the method of dewatering using sumps and ditches stating its advantages and disadvantages. [7M]

#### UNIT – IV

7. a) Write short notes on: [7M]  
(a) Pre-grout investigation  
(b) Grout holes pattern  
(c) Selection of grout characteristics
- b) What is the procedure for cement grouting of cracks in concrete structures? [7M]
8. a) Describe in detail chemical stabilization of the soil with the help of an example. [7M]  
b) Explain in detail principle of ground modification at depth by grouting? [7M]

#### UNIT – V

9. a) What are the various types of geosynthetics & explain in detail four major applications of geosynthetics? [7M]  
b) Geosynthetics can be used as soil reinforcement “– Justify in detail with supporting sketches. [7M]
10. a) Write short note on: [7M]  
a) Soil nailing  
b) Rock bolting  
c) Ground Anchor  
d) Reinforced Earth
- b) With neat sketches explain in detail the various applications of reinforced earth for ground improvement? [7M]



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## COURSE OBJECTIVES:

The course should enable the students to:

I	Identify the types of soils and categorize the problematic soils by in-situ laboratory tests.
II	Design dewatering systems to prevent significant groundwater seepage into the excavation and to ensure stability of excavation side slopes.
III	Modify the ground by different procedures such as admixtures, shotcrete, grouting and ground freezing.
IV	Apply different methods of soil reinforcement like soil anchors, rock bolts and soil nails in cohesive and granular soils.

## COURSE OUTCOMES (COs):

CO 1	Describe different types of soils, In situ and laboratory tests to characterize soils.
CO 2	Describe various mechanical modification techniques like blasting, vibro compaction, dynamic tamping and compaction piles.
CO 3	Describe various dewatering methods, their choice and various hydraulic ground modification techniques.
CO 4	Explore the concept of soil modification by physical and chemical methods.
CO 5	Explain soil reinforcement technique, reinforcement with strip, in-situ ground reinforcement, ground anchors and soil nailing.

## COURSE LEARNING OUTCOMES (CLOs):

ACE509.01	Understand the needs and objectives of ground improvement techniques.
ACE509.02	Identify soil types by performing In Situ and laboratory tests to characterize problematic soils.
ACE509.03	Analyze Mechanical, hydraulic, physico-chemical methods of ground improvement techniques.
ACE509.04	Understand Electrical, Thermal methods, and their applications of ground modification.
ACE509.05	Understand the need for mechanical modification
ACE509.06	Analyze Deep Compaction techniques
ACE509.07	Recognize the need for Blasting vibro compaction
ACE509.08	Understand the objectives and techniques of hydraulic modification.
ACE509.09	Identify traditional dewatering methods and their choice
ACE509.10	Design of dewatering system and understanding electro-osmosis technique
ACE509.11	Understand Electro kinetic dewatering technique and Filtration technique used in geosynthetics.
ACE509.12	Analyze drainage and seepage control with geosynthetics.
ACE509.13	Identify preloading the vertical drains and understand Physical and Chemical Modification of admixtures.
ACE509.14	Analyze the importance of shotcreting and gunning Technology.
ACE509.15	Understand modification at depth by grouting, Crack grouting and compaction grouting
ACE509.16	Understand Jet grouting technique, Thermal modification, Ground freezing.

ACE509.17	Understand modification by inclusions and confinement
ACE509.18	Recognize the need for Soil reinforcement and grid reinforced soil.
ACE509.19	Analyze the importance of In-situ ground reinforcement.
ACE509.20	Understand ground anchors, Rock bolting and soil nailing.

### MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No		Course Learning Outcomes	Course Outcomes	Blooms Taxonomy Level	
1	a	ACE509.03	Analyze Mechanical, hydraulic, physic-chemical methods of ground improvement techniques.	CO 1	Understand
	b	ACE509.04	Understand Electrical, Thermal methods, and their applications of ground modification.	CO 1	Understand
2	a	ACE509.01	Understand the needs and objectives of ground improvement techniques.	CO 1	Understand
	b	ACE509.02	Identify soil types by performing In Situ and laboratory tests to characterize problematic soils.	CO 1	Remember
3	a	ACE509.06	Analyze Deep Compaction techniques	CO 2	Understand
	b	ACE509.05	Understand the need for mechanical modification	CO 2	Understand
4	a	ACE509.07	Recognize the need for Blasting vibro compaction	CO 2	Understand
	b	ACE509.08	Understand the objectives and techniques of hydraulic modification.	CO 2	Understand
5	a	ACE509.10	Design of dewatering system and understanding electro-osmosis technique	CO 3	Understand
	b	ACE509.09	Identify traditional dewatering methods and their choice	CO 3	Remember
6	a	ACE509.11	Understand Electro kinetic dewatering technique and Filtration technique used in geosynthetics.	CO 3	Remember
	b	ACE509.12	Analyze drainage and seepage control with geosynthetics.	CO 3	Understand
7	a	ACE509.15	Understand modification at depth by grouting, Crack grouting and compaction grouting	CO 4	Understand
	b	ACE509.16	Understand Jet grouting technique, Thermal modification, Ground freezing.	CO 4	Understand
8	a	ACE509.13	Identify preloading the vertical drains and understand Physical and Chemical Modification of mixtures.	CO 4	Remember
	b	ACE509.16	Understand Jet grouting technique, Thermal modification, Ground freezing.	CO 4	Understand
9	a	ACE509.17	Understand modification by inclusions and confinement	CO 5	Understand
	b	ACE509.18	Recognize the need for Soil reinforcement and grid reinforced soil.	CO 5	Understand
10	a	ACE509.20	Understand ground anchors, Rock bolting and soil nailing.	CO 5	Understand
	b	ACE509.19	Analyze the importance of In-situ ground reinforcement.	CO 5	Understand

Signature of Course Coordinator

HOD, CE