

IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017
GROUND IMPROVEMENT TECHNIQUES

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

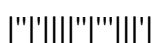
*Question paper consists of Part-A and Part-B**Answer ALL sub questions from Part-A**Answer any THREE questions from Part-B*

PART-A (22 Marks)

1. a) Discuss the principle of vertical drains in soil improvement. [4]
- b) Discuss the uses of dewatering process in soils. [4]
- c) List the admixtures used in clay soil stabilization. [4]
- d) Discuss the importance of soil nailing. [3]
- e) Write the classification of geosynthetics. [4]
- f) Write the objectives of grouting. [3]

PART-B (3x16 = 48 Marks)

2. a) What is dewatering? Explain the practical situation and purpose with examples where the dewatering techniques are employed commonly. [8]
- b) Explain with neat sketches the electro osmosis technique of dewatering from soil. [8]
3. a) What is grouting? Explain the engineering benefits of grouting of soils. [8]
- b) Describe the jet grouting technique of improving the soil with the neat sketches. [8]
4. What is the difference between shallow compaction and deep compaction? Explain in detail with neat sketches the vibroflotation technique of densification of deeper layers of granular soils and its quality control. [16]
5. What is the difference between chemical stabilization and mechanical improvement of soil? Explain in detail physic chemical reactions in stabilization of clay with lime. Also discuss the improvement of clay soil properties when lime is added. [16]
6. What are the components of reinforced earth wall? Discuss the load transfer mechanisms of reinforced earth walls. Also discuss the requirements of soil which can be used in reinforced earth wall construction. [16]
7. a) What are the different types of geotextiles? Discuss the differences between geogrids and geocells. [8]
- b) Discuss with neat sketches how effective the geocells in transferring the load onto the soft subgrade soil and also controlling the settlements. [8]



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PART-A (22 Marks)

1. a) Define preloading and discuss how settlement is controlled in soft clays. [4]
- b) List the types of dewatering systems. [4]
- c) List various soil stabilization methods. [4]
- d) Write the principles of reinforced earth. [3]
- e) Write the applications of gabions. [3]
- f) List various grouts and their basic characteristics. [4]

PART-B (3x16 = 48 Marks)

2. Write short notes on the following with reference to dewatering: (i) Horizontal wells (ii) Foundation drains and (iii) Blanket drains [16]
3. a) Write suitable grouting techniques suitable to improve silty sand soil. List the different stabilizers used in grouting. [8]
- b) Discuss in detail how the permeation grouting and jet grouting are conducted at the site and their effectiveness in improvement of soil properties. [8]
4. List various in-situ densification methods of deep soil layers.
It is proposed to construct large oil tanks for storage of oil at Vizag port in the water area by filling with soft reclaimed soil. From the SPT data available at the reclaimed soil site, it is noticed that the top 12m soil is soft clay (SPT "N" = 2 to 4) and below this up to a depth of 20m there is a dense soil (SPT "N" = 22 to 28). For the above soil conditions, suggest whether soil improvement is required or not. If required what extent the soil is required to improve? Explain any one of the suitable ground improvement techniques with neat sketches. The required safe bearing capacity is 175 kPa. [16]
5. What are the different admixtures that are used in expansive clay soil stabilization? Discuss plasticity, swelling and strength characteristics of fly ash treated black cotton soils. Also discuss how calcium chloride modifies the soil characteristics. [16]
6. Discuss the assumptions and principles of reinforced earth mechanism. Explain the design steps of reinforced earth walls. [16]
7. What are the functions of geotextiles? Explain their use in earth dam and road construction works. [16]



Code No: RT41016

R13

Set No. 3

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Answer any THREE questions from Part-B

PART-A (22 Marks)

1. a) Write the sand columns installation procedure. [3]
- b) Write the effective dewatering systems in cohesive soils. [3]
- c) Discuss the effectiveness of utilizing granulated blast furnace slag in the road construction. [4]
- d) Discuss the bearing capacity failure in reinforced earth wall. [4]
- e) List various properties of geosynthetics. [4]
- f) Discuss the factors that influence the grout requirement. [4]

PART-B (3x16 = 48 Marks)

2. Why dewatering is required in soil? Explain with neat sketches dewatering using sumps and interceptor ditches. Also discuss dewatering in soil by single and multistage well point systems. [16]
3. Explain in detail with the equipments and grout materials how grouting by hydraulic fracturing is carried out in soils and rocks. Discuss any one suitable post grout quality control tests employed. [16]
4. a) What are the shallow soil compaction equipments? Discuss their suitability for different soils. [8]
- b) Differentiate the effects of standard and modified compaction on soils. [8]
5. What are the different methods employed to improve the soft clay soils. Explain with neat sketches the preloading and stone column techniques. [16]
6. a) What are the various soil stabilization techniques? Write their suitability with respect to the soil type. [8]
- b) Discuss the gradation limits for soil – cement stabilization and explain its construction procedure. [8]
7. a) Discuss the advantages and applications of reinforced earth structures with neat sketches. [8]
- b) Discuss the necessary requirements of geotextiles when used for different hydraulic & mechanical functions. [8]



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PART-A (22 Marks)

1. a) Write the specifications of dynamic compaction. [3]
- b) Write the effective dewatering systems in cohesionless soils. [3]
- c) Write the effectiveness of bitumen in soil stabilization. [4]
- d) Discuss the sliding failure in reinforced earth wall. [4]
- e) Write a note on woven geotextiles and non woven geotextiles. [4]
- f) What is the difference in single, double and triple fluid jet grouting? [4]

PART-B (3x16 = 48 Marks)

2. a) Discuss the effectiveness of various well point dewatering systems with respect to the in-situ soil conditions. [8]
- b) What is the working principle of vacuum well point system? Explain with neat sketch the process of dewatering carried out in-situ by vacuum well point system. [8]
3. a) Explain how grouting is effective in improving the engineering properties of soil. [8]
- b) Discuss in detail the grouting with 'soil-cement mixes', 'cement', and 'lime' grouts. [8]
4. Compare and contrast with neat sketches the effectiveness of vibroflotation over compaction piles to densify the granular soils. [16]
5. Explain working principles and soil improvement mechanism using 'Rammed Stone Column' and 'Vibro-Replacement' methods. Also highlight the typical characteristics and the relative effectiveness of both the methods. [16]
6. a) How effective is lime stabilization in stabilizing the clay soils? Discuss the chemical reactions that take place in lime treated soils. [8]
- b) What is bituminous stabilization? Discuss the necessary requirements to achieve best results in soil-bitumen stabilization. [8]
7. a) What is reinforced earth structure? Discuss its practical suitability with limitations. [8]
- b) Write the functions of geotextiles in an earth dam. [8]

