

Total Pages—5

(Set-K)

M.Tech. - 2nd(GTE)
Ground Improvement Techniques

Full Marks : 70

Time : 3 hours

Answer Q. No. 1 which is compulsory and
any five from the rest

The figures in the right-hand margin indicate marks

Assume suitable data wherever necessary

1. Answer the following questions : 2 × 10

- (a) List various soil properties which are generally improved through ground improvement techniques.
- (b) For $\Phi' = 28^\circ$ and $K_0 = 0.5$, calculate the grouting pressure.
- (c) Show the differences between sand piles and sand drains.

(Turn Over)

(2)

- (d) What is meant by radial consolidation ?
 - (e) State where and in which type of soil the use of vibro-flots are essential.
 - (f) State the usefulness of grouting.
 - (g) Enumerate the major functions of geo-synthetics.
 - (h) State the situation where vibroflotation technique is essential.
 - (i) What do you mean by tongue-and-groove splice ? Where and when are they used ?
 - (j) Enlist the soil stabilization measures to deal with earthquake forces.
2. The density of a 8 m deep loose sand deposit is to be increased by compaction piles. Estimate the amount of extra material that will have to be added to the soil per square meter of plan area if the dry density of the soil is to be increased from 15kN/m^3 to 18kN/m^3 . If the material to be added costs Rs. 300.00 per cubic meter and the cost of

(3)

constructing the compaction pile is 90% of the cost of construction material, what is the cost of treatment per square meter of plan area. 10

3. (a) What are various in-situ ground improvement techniques ? Discuss each of them in brief. 5

(b) Discuss how in-situ densification of soil is carried out using vibroflotation and vibro-compaction piling techniques. 5

4. Enumerate various geo-synthetics commonly used for ground improvement techniques ? What is a geo-net ? What are various properties of a geo-textile which are generally taken into consideration before their use ? What are the desirable properties ? Differentiate between transmissivity and permittivity ? A geosynthetic has to be selected to provide drainage behind a retaining wall with a vertical back face. The estimated vertical flow into the drain is $0.018 \text{ m}^3/\text{sec}$, determine the required transmissivity of the geosynthetic. 10

(4)

5. (a) Discuss the use of various additives in ground improvement. 5
- (b) How stone columns and blasting help soil stabilize and gain bearing capacity? 5
6. (a) Discuss the characteristics of a grout. Where and why grouting is required? What is compaction grouting? How is it done in the field? Discuss with neat sketches. Discuss the advantages and disadvantages of grouting. 5
- (b) How vertical drains help improve soil properties? Sketch an earthquake drain? Briefly explain its operations and usefulness in preventing liquefaction during earthquake loadings. 5
7. (a) What do you mean by accelerated pre-consolidation of clays? How is it achieved? Discuss the use of sand drains and sand wicks for the purpose. 5

(5)

(b) Discuss the steps for analysis and design of reinforced retaining walls.

5

8. Explain any *four* of the following :

$2\frac{1}{2} \times 4$

(a) Point grouting

(b) Lime column

(c) Aspect ratio and its utility

(d) Vibrating plates

(e) Permeation grouting

(f) Global stability.