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B.E / B.Tech (Full Time) DEGREE END SEMESTER

EXAMINATIONS, APRIL /MAY. 2014

CIVIL ENGINEERING

Seventh Semester

CE 9403 & GROUND IMPROVEMENT TECHNIQUES

(Regulation 2008)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What is the main objective of ground improvement techniques?
2. Name the various factors that must be considered in the selection of suitable ground improvement techniques?
3. What is the role of dewatering in ground improvement techniques?
4. Define the working principle of vacuum dewatering system and name the best suited soil for using this method.
5. Explain the basis of the densification for cohesionless soil and list few methods that are used to stabilize cohesionless soil.
6. List the various conditions that are to be satisfied for successful adoption of preloading technique in stabilization of soils.
7. What is the concept of reinforcement in improving the characteristics of soils?
8. What are the various types of reinforcement materials used for stabilization of soils?
9. Distinguish the conventional penetration grouting from the compaction grouting.
10. What are the factors which decide the rate of injection of grout into the soils?

Part – B (5 x 16 = 80 marks)

11. i) Explain in details of the various geotechnical problems involved in alluvial soils and name the various methods that are used to prevent these problems. (5+3 = 8)
ii) List the various types of reclamation materials and discuss in details about these materials for utilization of reclamation purposes. (2+6 = 8)
12. a What are the various methods of dewatering systems used for control of ground water in stabilizing the ground and discuss each method in details. (16)

(OR)

- b(i) A flow net analysis was performed for estimating the seepage loss through the foundation of a cofferdam, results of the flow net analysis gave a number of flow line $N_f=6$ and number of drops $N_d=16$. The head of water lost during seepage was 5 m. Assume the coefficient of permeability of the soil is $'k' = 4 \times 10^{-5}$ m/min. Estimate the seepage loss per meter length of the coffer dam per day. Also estimate the exit gradient if the average length of the last flow field is 0.9 m. (8)

- b(ii) What are the various drainage systems adopted to prevent ground water seeping into the existing structure and explain each drainage system in details. (8)
13. a(i) Explain in details of the various vibro-compaction methods used for insitu densification of cohesionless soils and write merits of each method. (6+4=10)
- a(ii) What are the stage wise steps followed for installation of sand compaction piles. (6)

(OR)

- b(i) Write detailed discussion about the installation procedure of stone column and discuss the soil conditions in which this method is more suited. (8+3=11)
- b(ii) Estimate the load capacity of a stone column installed in soft clay having the undrained cohesion of $c_u = 18 \text{ kN/m}^2$ and measured effective radial stress is 40 kN/m^2 . Assume the angle of internal friction of stone is 38° and a factor of safety of 2. (5)
14. a A earth retaining wall having 10 m in height is reinforced with galvanized steel strip in a granular backfill having $\phi = 30^\circ$, $\gamma = 16.0 \text{ kN/m}^3$. The steel strip width 'w' = 75 mm, the vertical and horizontal spacing between the strip from c/c is 0.5 m and 1 m respectively. The breaking strength of the steel ' f_y ' = $2.4 \times 10^5 \text{ kN/m}^2$ and relative friction angle ' δ ' = 20° . The foundation soil is having $\phi = 28^\circ$, $\gamma = 18.0 \text{ kN/m}^3$, $c = 35 \text{ kN/m}^2$, $N_c = 25$ and $N_\gamma = 16.7$. Assume the factor of safety against breaking and pull out is 3. Check for the external and internal stability of the wall. Assume the corrosion rate of the galvanized steel to be 0.025 mm/year and life span of the structure to be 50 years. (16)

(OR)

- b(i) How do you check the internal and external stability of a retaining wall reinforced with Geotextile? (8)
- b(ii) Explain the role of Geotextiles in filtration, drainage, separation and road works. (8)
15. a(i) What is the criterion used to decides the limit for suspension grouting and discuss in details of the various suspension material grouting. (2+8=10)
- a(ii) What is the principle of grouting? and explain the various functions of grouting in soil and rock. (2+4=6)

(OR)

- b(i) Explain in details about the various injection methods that are used for stabilization of soils by grouting techniques. (11)
- b(ii) Briefly discuss on the various applications of grouting technique in insitu stabilization of soils. (5)
