19/11/13

Roll No. | | | | | | | | |

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC. 2013

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 role of ground improvement in foundation engineering?
2. What do you meant by reclaimed soil and list out few examples?
3. What are the main functions of dewatering systems to improve the geotechnical characteristics of a ground?
4. Write the various factors that need to be considered in selecting the appropriate measures to control of surface water?
5. What are the basic mechanisms involved in in-situ densification of cohesive soil? and list out few techniques to stabilize in-situ cohesive soil.
6. How do you assess the suitability of the backfill materials used in vibroflotation method for ground stabilization?
7. Distinguish the reinforced concrete from the reinforced soil.
8. Explain the role of geotextiles in separation and in filtration work.
9. Define groutability ratio (GR) and give the limiting value?
10. List out the various disadvantages of using compaction grouting technique for stabilization of soils.

Part – B (5 x 16 = 80 marks)

11. i) Explain in details on the various effect which contributes for possible alterations of ground after formation. (8)

    ii) What are the major geotechnical problems in black cotton soils and discuss on the basic principles of each identified problem. Also discuss the appropriate techniques that can be used for controlling the problems. (2+3+3 = 8)

12. a(i) In a field pumping test, a fully penetrating well was sunk through a horizontal stratum of sand 15 m thick and underlain by a clay stratum. The radius of influence of water flow was at a horizontal distances of 30 m from the pumping well and the radius of well was 80 mm. The initial position of the water table was 2.0 m below the ground level. The water level in the well h_w = 5.0 m from the ground surface. The coefficient of permeability of the sand 'k' = 1.81×10^{-4} m/sec. Estimate the quantity of discharge from the well at a steady state pumping rate of litres/hour. If the total quantity of water to be

pumped out from an excavation area is 0.93 m^3/sec, determine the total number of wells required to pump out water from the excavation area. (8)

a(ii) Discuss the dewatering scheme by electro – osmosis method and write the merits and demerits of this method. (5+3 = 8)

(OR)

b(i) Two rows of sheet piles are driven to a depth of 4.4m blow the sand deposit to form a coffer dam. Excavation is then carried out within the coffer dam upto a depth of 3.3 m below the water table level by keeping the area free from water by pumping. The flow net analysis gave N_f = 6 and N_d = 11 and width of flow channel at bottom of the excavation is 0.65 m. The sand deposit is having 'k' = 3×10^{-3} cm/sec and underlain by an impermeable stratum at a depth of 6.0 m below the sand deposit. What is the quantity of flow into the cofferdam per hour per meter length of the sheet pile walls? Is there any danger of quick condition developing at bottom of the excavation? Assume specific gravity and void ratio of the sandy soil is 2.68 and 1.01 respectively. (8)

b(ii) List out the various steps involved in the design of dewatering system to control water during civil construction and Briefly discuss. (8)

13. a(i) What basis the insitu densification of cohesionless soil is working? Explain the procedure for insitu ground treatment using vibro flotation and write the various merits of this method. (2+5+3 = 10)

a(ii) Discuss the method of ground treatment using preloading with vertical drains. (6)

(OR)

b(i) Wick drains have been used to stabilize a saturated clay ground and drains are arranged in square pattern. Estimate the times required for 60, 70 and 90 % consolidation of a saturated clayey soil at various square spacings and also estimate the appropriate spacing between the drains. The wick drains measure 100 × 5 mm and the soil has a horizontal coefficient of consolidation $c_h = 7.1 \times 10^{-6}$ m^2/min. (8)

b(ii) Discuss in details of the lime stabilization method used for ground treatment. Also list out the merits and demerits of this method. (8)

14. a A 8 m high earth retaining wall reinforced with steel strip in a granular backfill having ϕ = 30°, γ = 17.0 kN/m^3. The steel having width of the strip 'w' = 80 mm, the vertical and horizontal spacing between the strip from c/c is 0.5m and 1m respectively. The breaking strength of the steel strip 'f_y' = 2.8×10^5 kN/m^2 and the relative friction angle 'δ' = 20°. The foundation soil is having ϕ = 30°, γ = 18.5 kN/m^3, c = 40 kN/m^2 N_c = 30, N_q = 18 and N_γ = 22. Assume both the factor of safety against breaking and pull out is 3. Check for the internal and external stability of the wall. Assume the corrosion rate of the steel strip to be 0.030 mm/year and life span of the structure to be 50 years. (16)

(OR)

b(i) A geotextile reinforced retaining wall of 7 m high for the granular backfill having γ = 18 kN/m^3 and ϕ = 34°. A woven slit film with warp direction having allowable strength of σ_G = 50 kN/m and δ = 26° is intended to be used for the construction. The factor of safety against both breaking ($FS_{(b)}$) and pull out ($FS_{(p)}$) is 1.5. For the design of wall, determine the vertical spacing (S_v), length (L_G) and lap length (L_l) of the geotextile. (10)

b(ii) Discuss the various applications of geosynthetics in ground engineering. (6)

15. a(i) List out two different types of grouting materials that can be used for ground treatment and discuss in details of each type with examples. (10)

a(ii) Briefly explain the ground treatment method by using compaction grouting. (6)

(OR)

b Discuss in details on the various stages wise procedures for ground treatment using grouting method. (16)