G 363 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Civil Engineering

CE 010 602 – GEOTECHNICAL ENGINEERING – II (CE)

(New Scheme – 2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. Discuss briefly about the types of sub-surface soundings in soil exploration.
2. Define active earth pressure. Explain its significance in computation of lateral earth pressure.
3. Enumerate the steps involved in conducting the plate load test.
4. What is meant by proportioning footings for equal settlement?
5. Comment on the effects of negative skin friction in pile driving.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. With neat sketches, explain the various sampling tools used in sub-surface investigation.
7. Differentiate between the Rankine's and Coulomb's theory for cohesionless soils.
8. Explain the Skempton's analysis for the computation of bearing capacity.
9. Enumerate the steps involved in the design of a combined footing which is trapezoidal in plan.
10. Briefly explain the problems encountered during the well sinking operation.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*

Each question carries 12 *marks.*

11. A column of a building transfers a concentrated load of 225 kN to the soil in contact with the footing. Estimate the vertical pressure at the following points by making use of the Boussinesq and Westergaard equations. (i) Vertically below the column load at depths of 5, 10 and 15 m ; (ii) At radial distances of 5, 10 and 20 m and at a depth of 10 m.

Or

12. Three footings are placed at locations forming an equilateral triangle of 10 m sides. Each of the footings carries a vertical load of 110 kN. Estimate the vertical pressures by means of the Boussinesq equation at a depth of 9 m at the following locations : (i) Vertically below the centers of the footings ; (ii) Below the center of the triangle.

13. A retaining wall with a vertical back of height 7.32 m supports a cohesive soil of unit weight 17.3 kN/m^3, an angle of shearing resistance = 20° and cohesion = 10 kPa. The surface of the soil is horizontal. Determine the magnitude and direction of the active thrust per meter of wall using Rankine theory.

Or

14. A counterfort wall of 10 m height retains a non-cohesive backfill. The void ratio and angle of internal friction of the backfill respectively are 0.70 and 30° in the loose state and they are 0.40 and 40° in the dense state. Calculate and compare active and passive earth pressures for both the cases. Take the specific gravity of solids as 2.7. Use Rankine's or Coulomb's theory.

15. A strip footing 1 m wide at its base is located at a depth of 0.8 m below the ground surface. The properties of the foundation soil are γ = 17.65 kN/m^3, φ = 20°, c' = 30 kN/m^2. Determine the safe bearing capacity, using a factor of safety 3. Use Terzaghi's analysis. Assume soil is subjected to local shear failure.

Or

16. A circular tank of diameter 3 m is founded at a depth of 1 m below ground surface on 6 m thick normally consolidated clay. The water table is at the base of the foundation. The saturated unit weight of soil is 19.5 kN/m^3, and the in-situ void ratio e_o is 1.08. Laboratory tests on representative undisturbed samples of the clay gave a value of 0.6 for the pore pressure coefficient A and a value of 0.2 for the compression index Cc. Compute the consolidation settlement of the foundation for a total contact pressure of 95 kPa. Use 2:1 method for computing Δp.

17. A square footing is to be constructed on a deep deposit of sand at a depth of 0.9 m to carry a design load of 300 kN with a factor of safety of 2.5. The ground water table may rise to the ground level during rainy season. Design the plan dimensions of the footing. Assume saturated unit weight is 20.8 kN/m^3, $N_c = 25$, $N_q = 34$ and $N_\gamma = 32$.

Or

18. Proportion a rectangular combined footing for a uniform pressure under DL+ reduced LL with the following data: Allowable pressures: 180 kPa for Dead load + reduced live Load and 270 kPa for dead load + live load, Column loads: Column A carries a DL of 500 kN and LL of 400 kN while Column B carries a DL of 660 kN and LL of 840 kN, c/c distance of columns = 5 m and the projection beyond column A is not to exceed 0.5 m. Dead load + Reduced Live Load for column A is 700 kN and that for column B is 1080 kN.

19. An n pile group has to be proportioned in a uniform pattern in soft clay with equal spacing in all directions. Assuming any value of c, determine the optimum value of spacing of piles in the group. Take $n = 25$, and $m = 0.7$. Neglect the end bearing effect and assume that each pile is circular in section.

Or

20. A reinforced concrete pile of size 30 × 30 cm and 10 m long is driven into coarse sand extending to a great depth. The average total unit weight of the soil is 18 kN/m^3 and the average N_{cor} value is 15. Determine the allowable load on the pile by the static formula. Use FS = 2.5. The water table is close to the ground surface.

(5 × 12 = 60 marks)