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B.TECH. DEGREE EXAMINATION, MAY 2016

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.*

1. What is bore log ? Explain its significance in site investigation.
2. Discuss briefly about the types and uses of sheet pile walls.
3. Comment on the effects of water table variations in Terzaghi's bearing capacity equation.
4. Enumerate the steps involved in selecting the type of foundation for a building.
5. What is meant by a floating foundation ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 marks.

6. Briefly explain the geophysical methods employed in sub surface investigations.
7. Explain the Culman's graphical method for the computation of lateral earth pressure.
8. Write down the equations commonly employed to compute the immediate and consolidation settlements clearly explaining the terms involved.
9. Differentiate between the shallow and deep foundations clearly explaining the functions of each.
10. With neat sketches, explain the construction details of a well foundation.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Three concentrated loads of 3000 kN, 1000 kN and 2000 kN, spaced at 4.5 m and 3.5m between the first and the second and the second and the third loads, are acting in one vertical plane at the surface of a soil mass. Calculate the resultant vertical stress produced by these loads on a horizontal plane 1.5 m below the surface, at points directly below the loads and also halfway between them. Plot the curve showing the vertical stress distribution.

Or

Turn over

12. A concentrated load of 200 kN acts at foundation level at a depth of 2 m below ground surface. Find the vertical stress along the axis of the load at a depth of 10 m and at a radial distance of 5 m at the same depth by : (a) Boussinesq and (b) Westergaard formulae for $n = 0$. Neglect the depth of the foundation.

13. Use the Rankine method to calculate the total active lateral force and location of the forces behind a 3.5 m high vertical wall. Assume that the soil has a total unit weight of 18 kN/m^3 and a friction value of 32 degrees. Assume that there is a uniform surcharge of 10 kPa located along the surface behind the wall. Groundwater is well below the depth of the foundation so that pore pressure does not develop behind the wall.

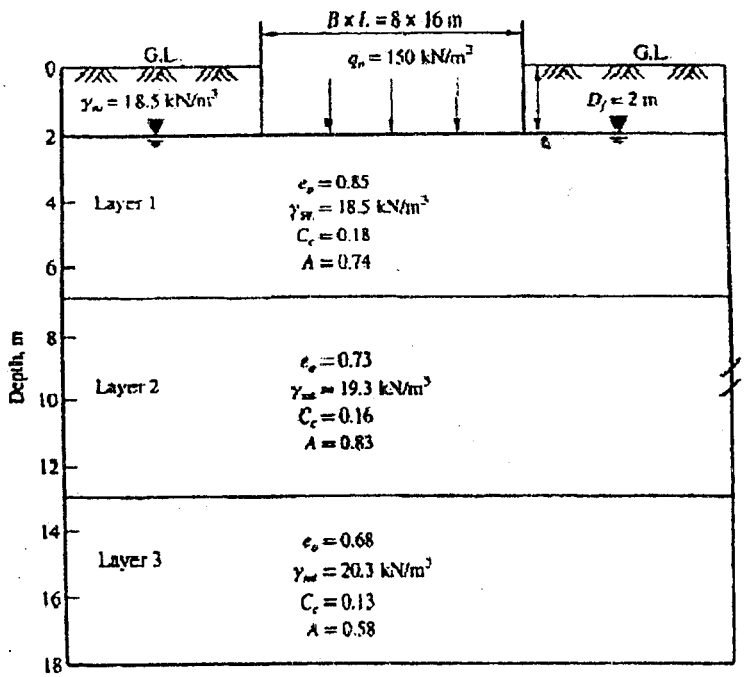
Or

14. A cantilever retaining wall of 7 metre height retains sand. The properties of the sand are : $e = 0.5$ friction angle = 30° and G = 2.7. Using Rankine's theory determine the active earth pressure at the base when the backfill is : (i) dry ; (ii) saturated and (iii) submerged, and also the resultant active force in each case. In addition determine the total water pressure under the submerged condition.

15. A strip footing of width 3 m is founded at a depth of 2 m below the ground surface in a $(c - \varphi)$ soil having a cohesion c = 30 kN/m^2 and angle of shearing resistance φ = 35°. The water table is at a depth of 5 m below ground level. The moist weight of soil above the water table is 17.25 kN/m^3. Determine : (a) the ultimate bearing capacity of the soil ; (b) the net bearing capacity ; and (c) the net allowable bearing pressure and the load/m for a factor of safety of 3. Use the general shear failure theory of Terzaghi.

Or

16. It is proposed to construct an overhead tank on a raft foundation of size 8 m × 16m with the foundation at a depth of 2 m below ground level. The subsoil at the site is stiff homogeneous clay with the water table at the base of the foundation. The subsoil is divided into 3 layers and the properties of each layer are given in Fig. Estimate the consolidation settlement by the **Skempton-Bjerrum Method.**



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_γ = 32.

Or

18. The end column along a property line is connected to an interior column of the same size by a trapezoidal footing. The column loads are Q1 = 2016 kN for the end column and Q2 = 1560 kN for the interior column. Size of columns : 0.46 × 0.46 m. The effective spacing between the columns is 5.48 m. Determine the end dimensions of the trapezoidal footing. The net allowable bearing pressure q_{na} =190 kPa.

19. A concrete pile of 45 cm diameter is driven through a system of layered cohesive soils. The length of the pile is 16 m. The following data are available. The water table is close to the ground surface. Top layer 1 : Soft clay, thickness = 8 m, unit cohesion c_u = 30 kN/m^2 and adhesion factor α = 0.90., Layer 2 : Medium stiff, thickness = 6 m, unit cohesion c_u = 50 kN/m^2 and α = 0.75. Layer 3 : Stiff stratum extends to a great depth, unit cohesion c_u = 105 kN/m^2 and α = 0.50. Compute Qu and Qa with Fs = 2.5.

Or

20. A mat foundation on saturated clay soil has dimensions 20m × 20 m. Given dead and live load = 48 MN, c_u = 30 kN/m^2, γ_{clay} = 18.5 kN/m^3

    (a) Find the depth, Df of the mat for fully compensated foundation

    (b) What will be the depth of the mat (Df) for a factor of safety of 2 against bearing capacity failure ?

(5 × 12 = 60 marks)