15/11/13

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

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

CIVIL ENGINEERING

Fifth Semester

CE 9303 & FOUNDATION ENGINEERING

(Regulation 2008)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What is meant by the significant depth of exploration? Write empirical guidelines for determining the depth of exploration.
2. What are the basic differences between the static cone penetration tests from standard penetration test?
3. What are the major criteria to be satisfied in the design of a foundation?
4. State whether the following statement is true or not and justify your answer. 'The factor of safety with respect to bearing capacity of two footings of width 1 m and 2 m and subjected to the same load intensity in a sand soil is the same'.
5. Write the various assumptions to be considered while proportioning of a cantilever footings?
6. What is the basic principle of a floating type mat foundations?
7. List out the various factors that are to be considered for the selection of pile type.
8. Define the 'group efficiency factor' of a pile group and list the factors influencing the efficiency of a pile group.
9. State whether the following statement is true or not and justify your answer. 'Retaining structures are mostly designed for active pressure and not for passive earth pressure'.
10. List out the various important assumptions involved in Coulomb's earth pressure theory.

Part – B (5 x 16 = 80 marks)

11. i) Determine the area ratio (A_r) for the soil sampler having an outer diameter of 50 mm and inner diameter of 30 mm and comment on the nature of soil sample obtained by the sampler. Based on the penetration test, the field N value in a deposit of fully submerged fine sand is 45 at a depth of 7.5 m. The average saturated unit weight of the soil is 18 kN/m^3. Estimate the corrected N value by considering the correction for overburden and dilatancy effect. (2+6 = 8)

    ii) List out various field penetration tests used in soil investigation and explain any one method in details. (3+5 = 8)

12. a(i) A 1.5 m wide strip footing is resting on a sandy soil stratum having unit weight of soil

γ_d = 18 kN/m^3, $\gamma_{sat.}$ = 21 kN/m^3, ϕ = 35°, and c =0 and its base at a depth of 1.5 m from ground level. Determine the safe bearing capacity of the footing if the ground water table is located (a) at a depth of 1m below the ground surface and (b) at a depth of 1.0 m below the base of the footing. Assume a factor of safety of 2 and bearing capacity factors N_q = 33.3 and N_γ = 48.03. (5+5 =10)

a(ii) Discuss the various factors influencing the bearing capacity of a footing on (a) a cohesionless soil and (b) a purely cohesive soil. (4+2 = 6)

(OR)

b(i) Estimate the dimension of a square footing to carry a load of 200 t from a column. The depth of foundation is to be kept at 2 m below the ground level. The maximum permissible settlement of the footing is 40 mm and a factor of safety of 3 is required against shear failure. The footing is resting in sand with an average corrected N value of 20 as estimated from soil borings. The ground water table is at a larger depth. Use Teng's correlations for estimating the width of square footing. (8)

b(ii) Discuss the procedure for conducting the plate load test on soils and How do you estimate the settlement of a footing on sand using the results of a plate load test? (8)

13. a(i) A trapezoidal footing is to support two square columns of 300 mm and 500 mm respectively. The centre to centre distance between two columns is 5 m and the safe bearing capacity of the soil is 400 kN/m^2.The bigger column will transmit a load of 500 t and the smaller column transmit a load of 300 t. Estimate the suitable size of the trapezoidal footing so that it does not extend beyond the column faces. (10)

a(ii) Discuss the method of proportioning of cantilever footings. (6)

(OR)

b(i) A building has to be supported on a R.C. raft foundation of dimensions 14 m × 25 m. The subsoil is clay having an average unconfined compressive strength of 30 kN/m^2. The pressure on the soil due to weight of the building and the loads that it carry will be 15 t/m^2 at the base of the raft. If the unit weight of the excavated soil is 19 kN/m^3, at what depth should the bottom of the raft be placed to provide a factor of safety of 3 against shear failure? Use Skempton's bearing capacity formula. (8)

b(ii) Discuss in details about the various problems to be considered in the design of a floating type mat foundations. (8)

14. a(i) A square precast concrete pile of size 500 × 500 mm is embedded in stiff clay soil having an unconfined compressive strength of 250 kN/m^2. Determine the pile length required to carry a safe working load of 700 kN with a factor of safety of 2.5. (8)

a(ii) What is 'negative skin friction' on pile and why does it cause concern? How do you estimate its value in clay and sandy soil? Suggest means of controlling it. (3+3+2 = 8)

(OR)

b(i) Estimate the safe load carrying capacity of a nine pile group arranged in a square pattern is embedded in sand. Piles are of 300 mm in diameter and 12 m in length are placed at a spacing of 900 mm in each direction. Assume the unit weight of soil as 18 kN/m^3, group efficiency factor η = 1, FS = 2, bearing capacity factors N_γ= 32.6 and N_q = 40. Use IS: 2911 – 1979 procedure for estimating the capacity of the pile group. If the settlement of the single pile is 5 mm, estimate the settlement of pile group using Skempton's formula. (8+2 = 10)

b(ii) How do you proceed to calculate the settlement of a group of friction and bearing piles in clay. (3+3 = 6)

15. a(i) A retaining wall of 8 m high with a smooth vertical back retains a clay backfill with $c' = 18\ kN/m^2$, $\phi' = 15°$ and $\gamma = 17\ kN/m^3$. Estimate the total active thrust on the wall assuming that tension racks may develop to the full theoretical depth. (8)

a(ii) What is earth pressure at rest? Derive an expression for determining the magnitude of earth pressure for at rest condition. (8)

(OR)

b(i) A retaining wall of 4.5 m high with a smooth vertical back. The backfill has a horizontal surface in level with top of the wall and carries a uniformly distributed surcharge load of 20 t/m^2. The density, angle of internal friction and cohesive value of soil is 1.9 t/m^3, 30° and zero respectively. Estimate the magnitude and point of application of the total active pressure per meter length of the wall. (8)

b(ii) Discuss in details on the method of estimating the active earth pressure on a retaining wall by using the Culmann's method. (8)

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