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A 1138

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Sixth Semester

Civil Engineering

CE 340 — FOUNDATION ENGINEERING

Time : Three hours   Maximum : 100 marks

(Use of I.S. 6403 is permitted)

Use of I.S. 456 is permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine the area ratio of a seamless tube sampler of inner diameter 48 mm and outer diameter 51 mm and comment on the nature of sample to be obtained in the sampler.

2. Why SPT values recorded at different depths are corrected for overburden?

3. What are the different types of foundation failure?

4. What is the reason for permissible settlement of foundation on clay is greater than sand?

5. Draw the contact pressure distribution diagram below rigid footings resting on clay and sand.

6. State various situations under which combined footing is preferred.

7. What is group efficiency of pile? Can it be greater than 1?

8. What is under reamed pile? When is it preferred?

9. What are the assumptions made in Rankine's analysis of earth pressure?

10. Make an estimate of lateral earth pressure coefficient on a basement wall supports soil to a depth of 2 m. Unit weight and angle of shearing resistance of retained soil are 16 kN/m³ and 32° respectively.

PART B — (5 ×16 = 80 marks)

11. (a) (i) What are different stages in site investigation? Discuss in detail. (8)

    (ii) Explain wash boring method of advancing bore hole. (8)

Or

(b) (i) Discuss in detail the selection of foundation based on soil condition. (8)

    (ii) Describe the salient features of a good sub soil investigation report? (8)

12. (a) (i) A square footing located at a depth of 1.5m from the ground surface carries a column load of 150 kN. The soil is submerged having an effective unit weight of 11 kN/m^3 and an angle of shearing resistance of 30°. Find the size of the footing using Terzaghi's theory, if factor of safety is 3; for $\phi = 30°$, Nq= 10 and $N_\gamma = 6.0$. (10)

    (ii) A 30 cm square bearing plate settles by 8 mm in the plate load test on cohesionless soil, when the intensity of loading is 180kN/m^2, Estimate the settlement of a shallow foundation of 1.6 m square under the same intensity of loading. (6)

Or

(b) (i) Find the net allowable load on a square footing of 2.5 m × 2.5 m. The depth of foundation is 2m and the tolerable settlement is 40 mm. The soil is sandy with Standard Penetration Number of 12. Take a factor of safety of 3. The water table is very deep. (8)

    (ii) A footing 2m square rests on a soft clay soil with its base at a depth of 1.5m from ground surface. The clay stratum is 3.5 m thick and is underlain by a firm sand stratum. The void ratio of clay is 1.08 and compression index is 0.18, cohesion is 50 kN/m^2. Compute the settlement that would result if the load intensity equal to the safe bearing pressure of soil were allowed to act on the footing. Natural water table is quite close to the ground surface. For given conditions, bearing capacity factor (Nc) is obtained as 6.9. Take factor of safety as 3. Assume load spread of 2 (vertical) to 1 (horizontal). (8)

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13. (a) (i) What are different types of shallow foundations? Explain with the help of sketches. (6)

    (ii) Design a rectangular combined footing for two columns 5 m apart. The exterior column of size 0.3 m × 0.3 m carries a load of 600 kN and interior column of size 0.4 m × 0.4 m carries a load of 900 kN. The allowable soil pressure is 100 kN/m². (10)

Or

(b) (i) Find the size and thickness of square reinforced concrete footing to carry a load of 800 kN from a column of size 0.4 m × 0.4 m. Take allowable soil pressure as 200kN/m². (6)

    (ii) Explain the conventional method of design of raft foundation. (10)

14. (a) (i) A pile is driven with a single acting steam hammer of weight 15 kN with a free fall of 900 mm. The final set, the average of the last three blows, is 27.5 mm, Find the safe load using the Engineering News Formula. (6)

    (ii) A group of 16 piles of 50 cm diameter is arranged with a center to center spacing of 1.0 m. The piles are 9m long and are embedded in soft clay with cohesion 30 kN/m². Bearing resistance may be neglected for the piles. Adhesion factor is 0.6. Determine the ultimate load capacity of the pile group. (10)

Or

(b) (i) A group of 4x4 piles is driven to bear in a dense sand Layer 2.5m thick. Pile spacing is 1.0 m c/c, diameter is 0.4 m. Total load on top is 3000 kN. A compressible layer of clay, 2 m thick exists below dense sand. Clay is underlain by rock. Find the settlement of pile group if co-efficient of volume compressibility of clay layer is $1.5 \times 10^{-4} m^2/kN$. (6)

    (ii) Describe various types of pile foundation. (6)

    (iii) What is negative skin friction? What is its effect on the pile? (4)

15. (a) A smooth vertical retaining wall 10 m high retains a cohesionless soil. The surface is level with the top of the wall and it carries a uniform pressure intensity of 14 kN/m². The unit weight of the top 3 m of the fill is 16 kN/m³ and angle of shearing resistance of 30° and the rest has unit weight of 20 kN/m³ and angle of shearing resistance of 35°. Determine the pressure distribution on the wall. Find also the point of application of the lateral earth pressure. (16)

Or

(b) (i) A retaining wall of smooth vertical back face of 5m height supports a level backfill of sand of unit weight 16 kN/m³ and angle of shearing resistance of 34°. Determine the total lateral active pressure per meter length of the wall, if the angle of critical failure surface is 28° to the vertical using Culmann's graphical construction. (10)

(ii) Discuss briefly the stability analysis of Retaining walls. (6)

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