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Question Paper Code : 40309

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Fifth/Sixth Semester

Civil Engineering

CE 8591 – FOUNDATION ENGINEERING

(Common to Environmental Engineering)

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   What is meant by SPT? What is its use?

2.   Define recovery ratio.

3.   What are the factors affecting bearing capacity?

4.   What are the methods of minimizing settlement?

5.   Under what circumstances combined footing is adopted.

6.   Furnish the situations under which raft foundation will be recommended?

7.   What are the different types of pile?

8.   What is meant by group efficiency?

9.   What are the assumptions of Rankines pressure theory?

10. If Poisson's ratio of soil is 0.3, find its coefficient of earth pressure at rest?

PART B — (5 × 13 = 65 marks)

11. (a)   Explain in detail about various types of sampler.   (13)

Or

     (b)   Explain in detail about penetration tests.   (13)

12. (a) Compute the safe bearing capacity of a circular footing of diameter 1.5 m located at a depth of 1.2 m in a cohesion less soil layer with an average saturated unit weight of 20 kN/m³ and the angle of internal friction of 20°, the corresponding bearing capacity factors are given as follows, $N_c = 17.7$, $N_q = 7.4$, $N_\gamma = 5$. Take a factor of safety 2.5. Water table is quite deep. What will be the percentage reduction in the value if the water table rises to surface? (13)

Or

(b) Explain in detail about plate load test and its limitations. (13)

13. (a) Proportion the dimension of a trapezoidal combined footing for two columns of size 600 mm × 600 mm carrying loads of 3500 kN and 2000 kN. The face of the heavier column is at a clear distance of 0.20 m from the property line. The centre to centre distance between the columns is 4.5 m. Take the allowable soil pressure as 250 kN/m². (13)

Or

(b) Discuss the choices of different shallow foundation with different site conditions. State the merits and demerits of each foundation type. (13)

14. (a) Explain with neat sketch about pile load test. (13)

Or

(b) In a 16 pile group the pile diameter is 45 cm and centre to centre spacing of square group is 1.5 m. If cohesion is 50 kN/m², determine whether failure would occur with pile acting individually or as group? Also determine group efficiency. All piles are 10 m long. Take m = 0.7 for shear mobilization factor around each pile. (13)

15. (a) A smooth vertical wall of height 4 m, retains a cohesionless backfill with an angle of internal friction of 30°, void ratio of 0.62 and specific gravity of solids of 2.7. Determine and draw the active earth pressure distribution diagram if the soil is (i) Dry (ii) Saturated (iii) Submerged.

(13)

Or

(b) Discuss briefly, the Culmann's graphical method to obtain active earth pressure. (13)

PART C — (1 × 15 = 15 marks)

16. (a) A strip footing is needed to carry a load of 500 kN/m at a depth of 1 m. Shear strength parameters for the soil are c = 0 and $\phi = 36°$. Determine the minimum width of footing for a factor of safety of 2.5 against shear failure. Take Gs = 2.65, e = 0.5, unit weight is 16 kN/m³. Nc = 50.58, Nq = 37.75, $N_\gamma = 56.31$. (15)

Or

(b) Design a pile group to carry 4000 kN in a soil of uniform clay to a depth of 6 m underlain by hard rock. The unconfined compressive strength (average) of the clay is 25 kN/m². Adopt a factor of safety of 3 against shear failure. (15)

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