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Question Paper Code : 50542

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Fifth Semester

Civil Engineering

CE 3503 — FOUNDATION ENGINEERING

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the limitations of auger boring.
2. What is a representative sample?
3. State the factors influencing bearing capacity.
4. Differentiate between the safe bearing capacity and allowable bearing capacity.
5. State the situation under which the trapezoidal combined footing is preferred.
6. What is a floating foundation?
7. State the advantages of pile foundation.
8. Compare the independent action and group action of a pile group.
9. What is plastic equilibrium?
10. Furnish the basic difference between the Rankine's theory and coulomb's theory in the analysis of retaining wall.

PART B — (5 × 13 = 65 marks)

11. (a) Discuss how the safe bearing capacity can be estimated from the standard penetration test.

Or

(b) Discuss the selection of foundation based on various soil conditions.

12. (a) A circular footing is to be rested at a depth of 1.80 m on stiff clay having unconfined compression strength 200 kPa. The footing is expected to carry a column load of 1000 kN. Assume a factor of safety 3 and bulk unit weight of soil as 18 kN/m^3. Using Terzaghi's approach, determine the diameter of the footing if the water table is

(i) At ground level. (6)

(ii) At footing level. (7)

Or

(b) A rectangular footing 2 m × 4 m rested at a depth of 1.2 m from EGL in soil having unit weight 17.5 kN/m^3, cohesion 22 KPa and the angle of internal friction 25 degrees. Considering a factor of safety of 2.5 against shear failure, determine the safe bearing capacity of the footing as per IS 6403 method, when the footing fails under

(i) General shear failure. (6)

(ii) Local Shear failure. (7)

13. (a) Discuss with neat sketches the circumstances under which the following footings are preferred

(i) Rectangular combined footing. (4)

(ii) Strap footing. (4)

(iii) Mat foundations. (5)

Or

(b) Proportion a combined footing for two columns A and B situated at a centre to centre distance of 4 m. Column A of size 300 mm × 300 mm carrying a load of 600 kN and that of B are 400 × 400 mm and 800 kN respectively. The safe bearing capacity of soil is 180 kN/m^2. Assume there is no space constraint.

14. (a) A 4 × 4 square pile group was driven into a clay extending to a large depth. The diameter and length of the piles were 300 mm and 8 m respectively. If the UCC strength of clay is 180 kPa, the centre to centre pile spacing is 750 mm, factor of safety is 3 and the adhesion factor is 0.65, determine the group capacity.

Or

(b) Explain pile load test and discuss how the pile capacity can be estimated from the pile load test as per IS : 2911.

15. (a) A RCC retaining wall with smooth vertical back retains a purely cohesive fill. Height of wall is 6 m. The unit weight of backfill is 17 kN/m^3. Cohesion is 20 kPa. Determine the,

(i) Distribution of active thrust across the depth of the wall. (4)

(ii) Distribution of passive thrust across the depth of the wall and Point of application of resultant. (4)

(iii) Maximum possible depth of tension crack that may generate over the surface of the backfill. (5)

Or

(b) A masonry retaining wall 0.6 m wide at top and 2.4 m wide at its bottom is 3.0 m high. The vertical face of retaining wall retains a soil of unit weight 18 kN/m^3 and the angle of internal friction is 30 degrees. Assume a coefficient of friction at the base is 0.5 and the safe bearing capacity of soil at the base of the wall is 250 kPa. Assess the stability of the retaining wall.

PART C — (1 × 15 = 15 marks)

16. (a) Assume you are appointed as geotechnical engineer for an Industrial complex construction extending to 100 hectare. Plan and discuss the details of soil investigation programme to be carried out as per IS 1892 provisions.

Or

(b) Compare the analysis, function and installation of under reamed pile with the conventional pile.

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