Model Question Paper

VI Semester B.Tech Civil Engineering (2013 scheme)

13.604 GEOTECHNICAL ENGINEERING - II

Time : 3 hrs
Max:100 marks

Instructions: (i) Table showing Terzaghi's bearing capacity factors is allowed.
(ii) Table showing bearing capacity factors, shape factors, depth factors and inclination factors as per IS 6403- 1981 are allowed.
(iii) Graph sheets may be supplied on request.

PART A (Answer all Questions)

1. The net ultimate bearing capacity of a footing of size 2m x 2m was estimated to be 240kPa. Maximum load that can be applied on the footing without exceeding the permissible settlement limits was also computed and obtained as 240kN. Determine the allowable bearing capacity of the footing, If the required factor of safety against shear failure is 3.
2. Briefly discuss soil stabilization through pre- loading.
3. Explain active and passive states of plastic equilibrium. Give any one practical example of each of these.
4. Define pressure bulb. Discuss its practical significance.
5. How can the safe load on a pile be estimated from static pile load test results.

(5x 4 = 20 marks)

PART B (Answer any one full question from each module)

Module I

6. Calculate the net safe bearing capacity of a rectangular footing 2m x 4m in plan, founded at a depth of 1.5 m below the ground surface. The load on the footing acts at an angle of 15° to vertical. Saturated unit weight of soil = 18kN/m^3, cohesion = 15kPa, angle of internal friction = 30°. Natural water table is at a depth of 2m below ground surface. Use IS 6403- 1981 recommendations. Assume the soil to be fully saturated above water table and factor of safety against shear failure as 2.5. **(20)**

7. State the assumptions, equations and limitations of Terzaghi's bearing capacity theory for strip footings. Differentiate between local shear failure and general shear failure with neat sketches. **(20)**

Module II

8. Determine the plan dimension of a combined footing to support two columns (Column A: Q = 1000 kN, size = 0.3 m x 0.3 m ; Column B : Q= 800 kN, size = 0.2 m x 0.2 m). Centre to centre distance between columns is 3.6 m. Distance available beyond the outer face of the 1000 kN column is only 0.2 m. Assume safe bearing capacity of the column as 270 kPa. Also mention the situations wherein combined footings are needed. **(20)**

9. Determine the total lateral earth pressure in the case of a 6m high retaining wall carrying a uniform surcharge of 14kPa, for the soil data given below.

   Upper stratum: cohesion = 16kPa, angle of internal friction = 30°. unit weight of soil = 16kN/m^3, Thickness = 2m

   Lower stratum; angle of internal friction = 40°. unit weight of soil above water table = 18kN/m^3,, saturated unit weight of soil = 20kN/m^3.

   Water table is at a depth of 4m below the surface of backfill. Assume that tension cracks are not likely to develop. **(20)**

Module III

10. a) Differentiate between Boussinesq's theory and Westergaards theory. **(10)**

b) A circular footing of diameter 3m is subjected to a uniform pressure of 200 kPa. Compute the depth beneath the centre of the loaded area at which vertical stress would reduce to 20kPa. **(10)**

11. (a) Explain the corrections to be applied to Standard Penetration Test results. **(10)**

(b) Plot the variation of vertical stress beneath the centre of a strip footing of 3m width which carries a uniform pressure of 140kPa. **(10)**

Module IV

12. A 2 x 3 pile group (diameter of pile = 400 mm; length = 10m) is installed in a layered cohesive soil with the following properties.

    Upper layer: cohesion = 70 kPa; adhesion factor = 0.5; unit weight of soil=16 kN/m^3; Thickness=6m.

    Lower layer; cohesion = 150 kPa; adhesion factor = 0.4; unit weight of soil = 20 kN/m^3.

    Determine the safe load carrying capacity of the pile group. **(20)**

13. a) Briefly explain any four methods for rectification of tilts and shifts with neat sketches. **(12)**

b) What is meant by Coefficient of uniform elastic compression. Mention any two methods for vibration isolation. **(8)**