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Question Paper Code : 31007

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

15.5.13 - FN

Fifth Semester

Civil Engineering

080100029 — FOUNDATION ENGINEERING

(Regulation 2008)

Time : Three hours Maximum : 100 marks

(Use of any IS code is not permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the factors affecting quality of samples?

2. What is the criterion to decide the spacing of bore holes?

3. How the depth of foundation is decided?

4. How would you estimate the immediate settlements of foundations on clay?

5. When do you provide trapezoidal combined footing?

6. A one-storey wood frame house is to be built on a site that is underlain by clay with a plasticity index of 40%. Might this house be prone to distress due to expansive soils? Why or why not?

7. What are different types of piles based on their construction?

8. What is the procedure used to get the group efficiency by Feld's rule?

9. State the difference between the active, at-rest and passive earth pressure conditions.

10. What is the effect of rise in the ground water table behind the rigid retaining wall on lateral earth pressure?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain in detail the rotary drilling technique. State also its advantages over other methods of boring. (8)

(ii) Explain different parts of Piston Sampler along with its operating principle. (8)

Or

(b) (i) At a site the soil is fine sand and has a unit weight of 17kN/m^3 and the water table is at a depth of 3m. The observed N values at the site were as follows:

Depth, m	3	6	9	12	15
N_{obs}	9	8	17	19	25

Calculate the corrected N value. From the data given suggest a suitable value of angle of internal friction. (8)

(ii) Describe the interpretation of SCPT data for the design of foundation. (8)

12. (a) (i) Distinguish between "local shear failure" and "general shear failure" in relation to design of foundations in sands. Where would you expect each of them to occur? What corrections you would incorporate in Terzaghi's bearing capacity equation to work out bearing capacity when foundation does not fail by general shear but fails by local shear? (8)

(ii) A loading test was conducted with a 300mm square plate at a depth of 1m below the ground surface in a pure clay deposit. The water table is located at a depth of 4m below the ground level. Failure occurred at a load of 45kN. What is the safe bearing capacity of a 1.5m wide strip footing at 1.5m depth in the same soil? Assume $\gamma = 18\ kN/m^3$ above the water table and a factor of safety of 2.5. (8)

Or

(b) (i) Compute the safe bearing capacity of a square footing 1.5m × 1.5m, located at a depth of 1m below the ground level in a soil of average unit weight 20kN/m^3. $\phi = 20°$, $N_C = 17.7$, $N_q = 7.4$, and $N_\gamma = 5.0$. Assume a suitable factor of safety and that the water table is very deep. Also compute the reduction in safe bearing capacity of the footing if the water table rises to the ground level. (8)

(ii) Two load tests were performed at a site-one with a 50cm square plate and the other with a 75cm square plate. For a settlement of 15mm, the loads were recorded as 50 kN and 90 kN, respectively in the two tests. Determine the allowable bearing pressure of the sand and the load which a square footing, 1.5m size; can carry with the settlement not exceeding 25mm. (8)

13. (a) Proportion a strap footing for the following data:

Allowable soil pressure:

for DL+reduced LL:150kN/m^2 for DL+LL:225kN/m^2

	Column A	Column B
Dead Load (DL)	540 kN	690 kN
Live Load (LL)	400 kN	810 kN

Distance c/c of columns: 5.4m; Projection beyond column A not to exceed 0.5m. (16)

Or

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

(ii) Discuss about the foundations on expansive soils. (6)

14. (a) (i) A precast concrete pile was driven in sand, using a 40kN hammer having a free fall of 1.0m. If the penetration of the pile in the last blow of the hammer was noted as 8mm, determine the load carrying capacity of the pile in kN using Engineering News Formula. (6)

(ii) It is proposed to provide pile foundation for a heavy column; the pile group consisting of 4 piles, placed at 2m center to center, forming a square pattern. The underground soil is clay, having c_u at surface as 60kN/m^2 and at depth 10m, as 100kN/m^2. Compute the allowable column load on the pile cap, if the piles are circular having diameters 0.5m each and length as 10m. (10)

Or

(b) (i) A concrete pile of 40cm diameter is required to be driven into a homogeneous mass of cohesionless soil. The pile carries a safe load of 650kN. A static cone penetration test conducted at the site indicates an average value of $q_c = 40$ kg /cm^2 along the pile and 120 kg/cm^2 below the pile tip. Calculate the factor of safety. (8)

(ii) Discuss the procedure to determine allowable load from single pile load test data. (8)

15. (a) A retaining wall of smooth vertical back face of 4m height supports a level backfill of sand of unit weight $15 kN/m^3$ and angle of shearing resistance of 32°. Determine the total lateral active pressure per meter length of the wall, if the angle of critical failure surface is 29° to the vertical using Culmann's graphical construction. Compare the results with Rankine's method. (16)

Or

(b) (i) A rigid retaining wall of 6 m height has two layers of backfill. The top layer to a depth of 1.5 m is sandy clay having $\phi = 20°$, $c = 15$ kN/m^2 and $\gamma = 16.4$ kN/m^3. The bottom layer is sand having $\phi = 30°$, $c = 0$ and $\gamma = 17.3$ kN/m^3. Draw the variation of lateral active earth pressure with height using Rankine's theory. Find also the total lateral active earth pressure and its point of application. (12)

(ii) What are different modes of failure of retaining wall? (4)