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Question Paper Code : 57173

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fifth Semester

Civil Engineering

CE 6502 – FOUNDATION ENGINEERING

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Differentiate disturbed and undisturbed samples.
2. What are the limitations of Static Cone Penetration test ?
3. What are the modes of failure of shallow foundations ?
4. List various methods of minimising total and differential settlement.
5. When does strap footing preferred ?
6. Draw the contact pressure distribution diagram below rigid footing resting on clay and sand.
7. State Feld's rule for determining group capacity of pile groups.
8. What is under reamed pile ? When is it preferred ?
9. Draw the variation of lateral earth pressure with wall movement.
10. Draw the force polygon for lateral active earth pressure on wall retaining cohesionless soil according to Coulomb's wedge theory.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Why SPT 'N' values recorded in sand at different depths are corrected for overburden and submergence ? How these corrections are applied ? **(8)**

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

OR

(b) (i) Explain the arrangements and operation of stationary piston sampler. State its advantages over other samplers. **(8)**

(ii) Explain in detail the salient features of bore log report. **(8)**

12. (a) (i) Determine the ultimate bearing capacity of a strip footing, 1.5 m wide, with its base at a depth of 1m, resting on a dry sand stratum. Take $\gamma = 17$ kN/m^3; $\phi = 38°$; Use IS code method. For $\phi = 38°$, $N_q = 48.9$ and $N_\gamma = 56.2$. **(8)**

(ii) The following data was obtained from a plate load test carried out on a 60 cm square test plate at a depth of 2 m below ground surface on a sandy soil which extends upto a large depth. Determine the settlement of a foundation 3.0 m × 3.0 m carrying a load of 1100 kN and located at a depth of 2 m below ground surface. **(8)**

Load intensity, kN/m^2	50	100	150	200	250	300	350	400
Settlement, mm	2.0	4.0	7.5	11.0	16.3	23.5	34.0	45.0

OR

(b) (i) A strip footing of 1.5 m wide, resting on a sand stratum with its base at a depth of 1m. The properties of the sand are : $\gamma = 17$ kN/m^3, $\gamma_{sat} = 20$ kN/m^3, $\phi = 38°$ and $c' = 0$. Determine the ultimate bearing capacity of the footing using Terzaghi's theory if the ground water table is located at a depth of 0.5m below the base of the footing. For $\phi = 38°$, assuming general shear failure $N_q = 60$ and $N_\gamma = 75$. **(8)**

(ii) Find the net allowable load on a square footing of 2.5 m × 2.5 m. The depth of foundation is 2 m 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)**

13. (a) (i) A trapezoidal footing is to be provided to support two square columns of 30 cm and 50 cm sides respectively. Columns are 6 m apart and the safe bearing capacity of the soil is 400 kN/m^2. The bigger column carries 5000 kN and the smaller 3000 kN. Design a suitable size of the footing so that it does not extend beyond the faces of the columns. **(10)**

(ii) Explain with neat sketch different types of shallow foundations. **(6)**

OR

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

(ii) Proportion 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/m^2. **(6)**

14. (a) (i) Classify the pile foundation based on (1) method of installation, (2) load transfer mechanism. **(6)**

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

OR

(b) (i) A group of nine piles, 12 m long and 250 mm in diameter, is to be arranged in a square form in a clay soil with an average unconfined compressive strength of 60 kN/m^2. Work out the center to center spacing of the piles for a group efficiency factor of 1. Neglect bearing at the tip of the piles. **(10)**

(ii) Discuss the method of obtaining ultimate load and also allowable load on a single pile from pile load test. **(6)**

15. (a) Explain Culmann's graphical method for determining active lateral earth pressure on rigid retaining wall. **(16)**

OR

(b) Explain Rankine's theory for active and passive earth pressures on rigid wall cohesive soil. Consider both presence and absence of tension crack for active case. **(16)**
