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B.E / B.Tech (Part Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2014

CIVIL ENGINEERING BRANCH

FIFTH SEMESTER

PTCE 340/ PTCE 373/ PTCE 9303 – Foundation Engineering

(Regulation 2002/2005/2009)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What are the factors affecting quality of samples?
2. List various methods of exploration.
3. How the depth of foundation is decided?
4. What are the different modes of failure of shallow foundations?
5. When do you provide trapezoidal combined footing?
6. Draw the contact pressure distribution diagram below rigid footings resting on clay and sand.
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. What are different states in which a soil mass can exist?
10. Compare Coloumb's wedge theory with Rankines theory.

Part – B (5 x 16 = 80 marks)

11. i) Explain in detail the rotary drilling technique. State also its advantages over other methods of boring. (8)
- ii) Explain in detail various salient features of bore log. (8)
12. a(i) A foundation, 2.0m square is installed 1.2m below the surface of uniform sandy gravel having a density of 19kN/m^3 above the water table and a submerged density of 10kN/m^3 below the water table. The strength parameters with respect to effective stress are $c'=0$ and $\phi'=30^\circ$. Find the gross ultimate bearing capacity for the following conditions: i) Water table is well below the base of the foundation ii) Water table rises to the level of the base of the foundation and iii) the water table rises to ground level. For $\phi = 30^\circ$, Terzaghi gives $N_q=22$ and $N_r=20$. (8)
- a(ii) Discuss the determination of bearing capacity from Standard Penetration Test. (8)

OR

- b(i) A square footing located at a depth of 1.5m from the ground surface carries a column load of 150kN. The soil is submerged having an effective unit weight of 11 kN/m^3 and an angle of shearing resistance of 30° . Find the size of the footing using Terzaghi's theory, if factor of safety is 3; For $\phi=30^\circ$, $N_q=10$ and $N_r=6.0$. (8)

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

13. a(i) Derive the relations between the dimensions of trapezoidal combined footing and unequal column loads Q_1 and Q_2 . (8)
- a(ii) Explain the conventional method of design of raft foundation. (8)

OR

- b(i) Proportion a rectangular combined footing for the following data:

Allowable soil pressure:

for DL+reduced LL: 180kN/m²; for DL+LL: 270kN/m²

	Column A	Column B
Dead Load (DL)	500kN	660kN
Live Load (LL)	400kN	840kN

Distance c/c of columns: 5m; Projection beyond column A not to exceed 0.5m. (12)

- b(ii) Discuss the concept of floating foundation. (4)
14. a(i) A concrete pile, 9m long, was driven by a single acting Vulcan Hammer with rated energy 35.26kJ. The total settlement as recorded for the last 10 blows was 2.5mm/blow. Using Engineering News Formula, calculate the pile capacity. (6)
- a(ii) Explain under-reamed pile foundation. State also the situation which warrants under-reamed pile foundation. (6)
- a(iii) What is negative skin friction? How to reduce it? (4)

OR

- b(i) A square group of 25 piles extends between depth of 2m and 12m in a deposit of 20m thick stiff clay overlying rock. The piles are 0.5m in diameter and are spaced at 1m centre to centre in the group. The undrained shear strength of the clay at the pile base level is 180kPa and the average value of the undrained shear strength over the depth of the pile is 110kPa. The adhesion coefficient (α) is 0.45. Estimate the capacity of the pile group considering an overall factor of safety equal to 3 against shear failure. N_c corresponding to $\phi_u=0$ is 9. (16)
- b(ii) Discuss the method of obtaining ultimate load and also allowable load on a single pile from pile load test. (6)
15. a. A retaining wall of smooth vertical back face of 4m height supports a level backfill of sand of unit weight 15kN/m³ 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. (16)

OR

- b(i) A retaining wall, 7.5m high, retains a cohesionless backfill. The top 3m of the fill has a unit weight of 18kN/m³ and angle of shearing resistance of 30° and the rest has unit weight of 24kN/m³ and angle of shearing resistance of 20°. Determine the pressure distribution on the wall. Find also the point of application of the lateral earth pressure. (12)
- b(ii) What are different modes of failure of retaining wall? (4)
