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**Question Paper Code : 90132**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019  
Fifth Semester  
Civil Engineering  
CE 8591 – FOUNDATION ENGINEERING  
(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A

(10×2=20 Marks)

1. Define area ratio.
2. What do you mean by soil exploration ?
3. Compare General shear and Local shear failure.
4. What are the various causes of settlement ?
5. Under what circumstances mat footing is adopted.
6. Furnish the situations under which trapezoidal combined footing will be recommended ?
7. Define negative skin friction.
8. What is an under reamed pile ?
9. Differentiate active and passive earth pressure.
10. If Poisson's ratio of soil is 0.4, find its coefficient of earth pressure at rest.

PART – B

(5×13=65 Marks)

11. a) Explain various methods of soil exploration.  
(OR)  
b) Explain standard penetration test. Write its advantages and its limitation. And also discuss correction on penetration value.
12. a) Compute the safe bearing capacity of a square footing  $1.5 \text{ m} \times 1.5 \text{ m}$  located at a depth of 1 m below the ground level in a soil of average density  $20 \text{ kN/m}^3$ ,  $\phi = 20^\circ$ ,  $N_c = 17.7$ ,  $N_q = 7.4$ ,  $N_\gamma = 5$ . Assume a suitable factor of safety and 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.  
(OR)  
b) What is differential settlement ? What are the causes ? Explain the remedial measures to be taken to minimize the differential settlement.



13. a) Two adjacent columns are to be supported by a trapezoidal combined footing. The heavier column carries a load of 5000 kN and size of 500 mm × 500 mm. The lighter column carries a load of 3500 kN with a size of 350 mm × 350 mm. The columns are 5.30 m c/c. Take allowable bearing capacity as 320 kN/m<sup>2</sup>. Assume the heavier column is on the property line. Proportion a suitable foundation.

(OR)

- b) Critically discuss the choices of different shallow foundation with different site conditions. State the merits and demerits of each foundation type.
14. a) Explain the different classification of piles with neat sketches.

(OR)

- b) A square pile group of 9 piles of 25 cm diameter is arranged with a pile spacing of 1 m. The length of the piles is 9 m. Unit cohesion of the clay is 75 kN/m<sup>2</sup>. Neglecting bearing at the tip of the piles determine the group capacity. Assume adhesion factor of 0.75.
15. a) A retaining wall, 4 m high supports a backfill having cohesion 22 KPa, angle of internal friction 29° and bulk unit weight 19.25 kN/m<sup>3</sup> with horizontal top flushes with top of the wall. The backfill carries a surcharge of 25 kN/m<sup>2</sup>. Draw the lateral earth pressure distribution diagram and compute the total active and passive earth pressure on the wall and their point of application.

(OR)

- b) Explain the Culmann's graphical procedure for determining the lateral earth pressure with neat diagram.

PART - C

(1×15=15 Marks)

16. a) A strip footing is needed to carry a load of 1000 kN/m at a depth of 1 m. Shear strength parameters for the soil are  $c = 0$  and  $\phi = 36^\circ$ . Determine the minimum width of footing for a factor of safety of 3 against shear failure. The water table may rise to the base of the footing. Take  $G_s = 2.65$ ,  $e = 0.6$ , unit weight is 16 kN/m<sup>3</sup>.  $N_c = 50.58$ ,  $N_q = 37.75$ ,  $N_\gamma = 56.31$ .

(OR)

- b) Design a pile group to carry 3000 kN in a soil of uniform clay to a depth of 6 m underlain by hard rock. The unconfined compressive strength (average) of the clay is 30 kN/m<sup>2</sup>. Adopt a factor of safety of 3 against shear failure.