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Question Paper Code : 91241

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fifth Semester

Civil Engineering

CE 2305/CE 54/10111 CE 505 — FOUNDATION ENGINEERING

(Regulation 2008/2010)

(Common to PTCE 2305/10111 CE 505 – Foundation Engineering for B.E. (Part-Time) Fifth Semester, Civil Engineering – Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by significant depth of investigation?

2. What are the functions of drilling mud?

3. What is the influence of size on bearing capacity of a surface continuous footing resting on a purely cohesive soil as per IS 6403?

4. Say true or false and justify your answer : In Terzaghi's bearing capacity theory, as the shearing resistance above the base of the footing is ignored, the bearing capacity is independent of depth of footing.

5. Plate load test is not applicable for heterogeneous soils. Why?

6. What is meant by 'partially floating foundation'?

7. How do the location of site and type of soil encountered influence the selection of the type of pile?

8. Can you design a driven pile using dynamic formulae? Justify your answer.

9. State the direction and magnitude of wall movement required for the mobilization of active and passive earth pressure respectively.

10. If the ratio between coefficient of passive earth pressure and that of active earth pressure is 9, find the angle of internal friction of the soil.

11. (a) (i) Explain with a neat sketch, how wash boring is done.

(ii) Compare standard penetration test with dynamic cone penetration test. (5)

Or

(b) (i) Distinguish between non-representative, representative and undisturbed samples and name the various laboratory tests that could be conducted in each of these samples. (9)

(ii) Explain the terms inside clearance and outside clearance for a sampler. (7)

12. (a) (i) A rectangular footing of size 1.5 m × 3 m rests on a clayey layer at a depth of 1.5 m below ground level. The load acts at an angle of 5° to the vertical and eccentric in the direction of width by 100 mm. The unconfined compressive strength of the clay is 150 kPa. Determine the safe load the footing can carry without the risk of shear failure. Adopt a factor of safety of 3. Use IS 6403 recommendations. (12)

(ii) Distinguish between net Safe Bearing Capacity and Allowable Bearing Capacity. (4)

Or

(b) (i) A building undergoes a settlement of 20 mm in 2 years and the ultimate settlement of the building is estimated to be 60 mm. Another building has a compressible layer underneath it similar to the other building except that it is 25% thicker. Assuming that the average pressure increase in both the cases is alike, find the ultimate settlement of the second building. Also, compute settlement of this building in 2 years. (13)

(ii) Enumerate the factors governing the selection of permissible settlement. (3)

13. (a) (i) A combined footing is to support two columns 250 mm × 250 mm and 300 mm × 300 mm carrying loads of 300 kN and 450 kN respectively. The columns are spaced at 4 m c/c. The allowable bearing capacity of the soil is 150 kPa. Find the plan dimensions of the footing if

(1) The first column alone is on the boundary line

(2) Both the columns are on the boundary line. (10)

(ii) Draw the contact pressure distribution diagram for flexible and rigid footings resting on sand and clay respectively. (6)

Or

through columns of sizes 400 mm × 400 mm and 250 mm × 250 mm respectively. The columns are spaced at 5 m c/c and the second column is on the boundary line. The width of the footing could be assumed as 2.2 m. The allowable bearing capacity of the soil is 250 kPa. (6)

(ii) What is meant by floating foundation? Where is it adopted? Find the factor of safety for such a foundation against shear failure. Also find the theoretical settlement of the foundation. (10)

14. (a) A group of 9 piles arranged in a square pattern is used as a foundation for a column in sand of angle of internal friction of 30°. Piles 300 mm in diameter and 10 m in length are placed at a spacing of 750 mm in each direction. Calculate the load carrying capacity of the pile group adopting a factor of safety of 2.5. Assume the unit weight of the soil as 18 kN/m³. The N_q and N_γ values are respectively 26 and 22.4.

The results of pile load test conducted on one of the above mentioned piles are given below :

Load (kN) :	0	150	200	250	300	400	500	600
Settlement (mm) :	0	1.45	2.25	2.75	3.6	5.75	10.75	30

Make an estimate of settlement of pile group, if the calculated safe load were applied on it. (16)

Or

(b) (i) A pile group of 3 rows with 3 piles in a row is made in a uniform clay deposit extending for a large depth with an unconfined compressive strength of 150 kpa. The diameter and length of the piles are 500 mm and 12 m respectively. The c/c spacing of the piles is 1.5 m in both the directions. The adhesion factor can be taken as 0.4. Find the load carrying capacity of the pile group by Converse Labarre's formula and Terzaghi's approach. (10)

(ii) Explain with a sketch how a driven cast in-situ pile is made. (6)

and hence discuss its limitations.

(ii) The height of a retaining wall with smooth vertical back is 6 m. The cohesionless backfill has a horizontal top surface and carries uniformly distributed surcharge of 30 kPa. The angle of internal friction of the soil is 30° and the water table is at a depth of 3 m below the top of the fill. Draw the active earth pressure diagram if the unit weight of the soil above and below water table is 18 kN/m^3 and 19.81 kN/m^3 respectively. (8)

Or

(b) A retaining wall with a vertical back is 8 m high and retains a cohesionless soil of angle of internal friction and unit weight of 30° and 18 kN/m^3 respectively. The angle of wall friction is 20°. The backfill surface is horizontal. By Culmann's graphical method, find the total active thrust, when there is

(i) No surcharge (6)

(ii) A surcharge of 36 kPa. (10)