

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH
BRANCH: CIVIL

SEMESTER : I
SESSION : MO/18

SUBJECT: CE516 - ADVANCED FOUNDATION ENGINEERING

TIME: 3:00 HRS.

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) Discuss the limitation of Prandtl's bearing capacity theory. How to rectify the same? [5]
- Q.1(b) A strip footing of 2.2 m width is to be founded at a depth of 1.2 m below GL. The highest possible location of the water table at the site is estimated to be at 0.8 m below GL. The soil profile shows the presence of a 0.5 m thick layer of fill material ($\gamma = 14.8 \text{ kN/m}^3$), which is underlain by a deep sand stratum having the following average properties:
Angle of internal friction = 25°
Void ratio = 0.99
Specific gravity of solids = 2.72
Water content above water table = 5 %
Determine the ultimate bearing capacity of the footing using Terzaghi's formula. [5]
- Q.2(a) What are the different types of combined footings? When to use them? [5]
- Q.2(b) Design a strap footing for the following data: [5]
Allowable pressures:
250 kN/m^2 for DL + reduced LL
325 kN/m^2 for DL + LL
Column loads:
- | | Column A | Column B |
|----|----------|----------|
| DL | 740 kN | 890 kN |
| LL | 600 kN | 1010 kN |
- Design the footing for uniform pressure under DL + reduced LL. Distance of c/c of columns = 5.4 m. Projection beyond column A not to exceed 0.5 m.
- Q.3(a) Distinguish between end bearing pile and friction pile. [2]
- Q.3(b) A group of 16 piles (4 x 4) was installed in a layered clay soil deposit. The diameter of each pile is 500 mm and their c/c distance is 1 m. The length of the pile group is 18 m. Estimate the safe load capacity of the group with a factor of safety of 2.50. Given, thickness of the top layer and bottom layer is 8 m and 16 m respectively. For top layer, $C_u = 25 \text{ kPa}$, $\Phi = 0^\circ$, adhesion factor = 1.0. For bottom layer, $C_u = 40 \text{ kPa}$, $\Phi = 0^\circ$, adhesion factor = 0.7. [8]
- Q.4(a) Evaluate different shapes of well foundations considering their advantages and disadvantages. [5]
- Q.4(b) What is ground loss? [2]
- Q.4(c) Compare between the different types of coffer dams. [3]
- Q.5(a) What are the factors affecting swelling of soil? [5]
- Q.5(b) Write a short note on chemical treatment of expansive soil. [5]

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