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

CLASS: MTECH **SEMESTER : I**
BRANCH: CIVIL **SESSION : MO/19**

SUBJECT: CE516 – ADVANCED FOUNDATION ENGINEERING

TIME: 3 HOURS **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.

Q.1(a) Compare between General shear and Local shear failure. Draw necessary figures. [4]

Q.1(b) A square footing of 2 m width has to carry a net vertical load of 2400 kN, excluding its self weight. The depth of foundation is 1 m. The subsoil consists of a stratum of dense sand having a bulk unit weight of 18.8 kN/m^3 and an angle of internal friction of 36°. Determine the factor of safety of the footing against a general shear failure. Use Terzaghi's equation. Given, for angle of internal friction of 36°, N_c = 65.8, N_q = 49.3, N_γ = 54. [6]

Q.2 Design a trapezoidal combined footing for uniform pressure under dead load (DL) plus reduced live load (reduced LL), with the following data: Allowable soil pressures- 170 kN/m^2 for DL + reduced LL; 240 kN/m^2 for DL + LL. [10]
Column loads:

	Column A	Column B
DL	640 kN	810 kN
LL	450 kN	1050 kN

Q.3(a) What is the use of underreamed pile? In which type of soil it is mostly used? [2]

Q.3(b) What do you mean by (i) Compaction pile, (ii) Batter pile? [2]

Q.3(c) A square pile group of 16 piles passes through a recently filled up material of 4.5 m depth. The diameter of the pile is 40 cm and pile spacing is 90 cm centre to centre. If the unconfined compression strength of the cohesive material is 60 kN/m^2 and unit weight is 15 kN/m^3, compute the negative skin friction of the pile group. [6]

Q.4(a) A circular well has an external diameter of 7.5 m and is sunk into a sandy soil to a depth of 20 m below the maximum scour level. The resultant horizontal force is 1800 kN. The well is subjected to a moment of 36000 kN-m about the maximum scour level due to lateral force. Determine whether the well is safe against lateral forces, assuming the well to rotate (i) about a point above the base, (ii) about the base. Assume submerged unit weight of soil = 10 kN/m^3, angle of internal friction = 36°. Use a factor of safety of 2 against passive resistance. [6]

Q.4(b) What are the different types of pier foundations? Mention the advantages of the same. [4]

Q.5(a) What are the tests used to identify expansive soil? Briefly discuss. [5]

Q.5(b) Write a short note on preventive measures/ treatment of expansive soils. [5]

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