

FACULTY OF ENGINEERING
B.E. 4/4 (Civil) I-Semester (Old) Examination, July 2014

Subject : Foundation Engineering

Time : 3 Hours

Max. Marks: 75

Note: Answer all questions of Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

- 1 What is the significance of a Isobar?
- 2 Sketch contact pressure distribution below rigid footing for sands and clays.
- 3 Distinguish between general shear failure and local shear failure.
- 4 What are the limitations of a plate load test?
- 5 Classify the piles according to materials used.
- 6 Explain field rule.
- 7 Sketch cellular and diaphragm coffer dams.
- 8 List the field test commonly used in soil investigation.
- 9 Explain log of bore hole.
- 10 What is meant by area ratio?

PART – B (50 Marks)

- 11 (a) Discuss the differences between Boussinesq and Westergaard's theories. (5)
 (b) A circular area of 7.5m in diameter on the ground surface carries a uniformly distributed load of 3kN/m^2 . Find the intensity of vertical pressure below the centre of the loaded area depth of 6m below the ground surface. Use Boussinesq's analysis. (5)
- 12 (a) List out the assumptions made in Terzaghi's bearing capacity. (5)
 (b) A continuous footing of width 2.5m rests 1.5m below the ground surface in clay. The unconfined compressive strength of clay is 150 kN/m^2 . Calculate the ultimate bearing capacity of the footing. Unit weight of soil is 16 kN/m^3 . Take $N_\gamma=0$, $N_q=1$ and $N_c=5.7$. (5)
- 13 (a) What are the limitations of Dynamic pile driving formulae? (5)
 (b) A 4x3 pile group has the following details:
 Diameter of each pile = 350 mm
 Centre to centre spacing of pile = 1m
 Determine the efficiency of pile group using converse laberre formulae. (5)
- 14 (a) Discuss the construction procedure of open caissons. (5)
 (b) Explain various methods of dewatering and their suitability. (5)
- 15 (a) Discuss the wash boring method of drilling holes for subsurface investigation. (5)
 (b) What are the different methods of timbering of trenches and explain any one in detail? (5)
- 16 Write detail notes on : (10)
 (a) Grouting (b) Pile load test
- 17 Write short notes on the following: (10)
 (a) Proportioning of footings (b) Permissible settlements (c) Percussion drilling

FACULTY OF ENGINEERING**B.E. 4/4 (Civil) I – Semester (New) (Supplementary) Examination, July 2014****Subject : Foundation Engineering****Time : 3 hours****Max. Marks : 75****Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.****PART – A (25 Marks)**

- 1 What is "Contact Pressure". Sketch the contact pressure distribution of a rigid footing laid on Cohesive and cohesion-less soil. 2
- 2 "Punching shear failure" is a type of failure of the shallow foundation wherein even a slight downward movement of the foundation will result bulging of soil at the surface". Answer yes or no and justify. 2
- 3 "The load carrying capacity of a pile driven in fully saturated fine sandy strata estimated using Dynamic formulae will be higher than the actual due to localized momentary liquefaction". Answer yes or no and justify. 2
- 4 Name the type of Caisson which is pre-cast with its bottom closed and top open. Comment on its suitability. 2
- 5 What is a "Chunk / Block sample"? In which method of geotechnical investigations it is feasible to collect such a sample. How do you rate its quality? 2
- 6 Differentiate "Safe Bearing Capacity" with "Allowable Bearing Capacity". In a given case, the SBC was 280 kPa and the allowable pressure for the permissible settlement was 150 kPa. Determine the allowable bearing capacity. 3
- 7 Prove that, the ultimate bearing capacity of shallow foundations on Cohesive ($\phi = 0$) soil is independent of size of the footing. 3
- 8 Sketch a typical timber braced cut and name the parts. 3
- 9 Describe "Tile and Shift" in sinking of a caisson foundation. Suggest any three methods for its rectification. 3
- 10 What is "Refusal" in a SPT? What is the criteria to consider refusal is observed? 3

PART – B (50 Marks)

- 11 a) From fundamentals, derive the expression for increment in vertical stress beneath centre for a uniformly loaded circular area of diameter "2a" with a UDL of intensity "q" adopting Boussinesque's theory. 5
- b) A ground level service reservoir is provided with a raft foundation of 6m diameter which is transmitting a udl of 3500 kN/sqm. Later, helical stair case with central post is constructed such that it lies at one of the corners of the imaginary square inscribing the raft. If the stair case post is transmitting a load of 9000 kN, determine the increment in vertical stress at a point lying 0.50m below center of the raft before and after construction of the stair case. 5

- 12 a) Design a strip footing for a load bearing wall transmitting a force of 200 kN/m proposed to be laid at a depth of 1.50 m below the GL on a c- Φ soil with $c = 40$ kPa $\Phi = 20^\circ$, $\gamma = 17$ kN/cum. Give $N_c^1 = 11.80$; $N_q^1 = 3.90$; $N\gamma^1 = 1.70$. 5
- b) What is "Proportioning of Footings"? Explain its objective and the procedure. 5
- 13 a) Estimate the safe load carrying capacity of a single vertical bored cast-in-situ pile of 500mm diameter installed in to a medium dense sandy strata to a depth of 12m. Give the average properties of sand along shaft of the pile as $\gamma = 18.50$ kN/m³, $\Phi = 30^\circ$; $k = 1.80$; $\delta = (2/3)\Phi$. The properties of sand at the tip of pile include $\gamma = 19$ kN/cum; $\Phi = 35^\circ$; $N_q = 94.60$. Consider the critical depth factor $d_c / d = 14$, FOS = 3.0. (6)
- b) Explain the "Pile Load Tests" in detail. (4)
- 14 a) A group of 20 piles, arranged in 4 x 5 pattern are provided in a Clay deposit to a depth of 12m. The size of each pile is 450 mm dia provided at a c/c spacing of 1.05 m. The average properties of the clay along the shaft are $q_u = 100$ kPa, adhesion factor = 0.58. The unconfined compressive strength of the clay at the tip of piles is $q_u = 160$ kPa, determine the safe load carrying capacity of the pile group. Adopt FS=2.50. (5)
- b) With the help of a neat sketch, show the components of an "Open Caisson" and explain the function of each component. (5)
- 15 a) Write a detailed note on Cofferdams including their necessity, types of coffer dams, merits and demerits of each and their suitability with the help of neat sketches. (5)
- b) Write a detailed note on methods of dewatering adopted in construction of foundations. (5)
- 16 a) Explain various methods of "Timbered Excavations" with the help of neat sketches. 5
- b) Write a detailed note on Bore hole method of geotechnical investigations. 5
- 17 Write a note on any two of the following : 10
- Settlement analysis of shallow foundations
 - Negative skin friction
 - Pneumatic caissons
 - Standard Penetration test
