Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech/CE/SEM-7/CE-703/2012-13

2012
FOUNDATION ENGINEERING

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

   i) Undisturbed soil samples are best collected by

      a) thin walled samplers

      b) thick walled samplers

      c) direct excavation

      d) augers.

   ii) The load carrying capacity of friction piles in a group in clay

      a) increases

      b) decreases

      c) sometimes increases and sometimes decreases

      d) remains unaltered compared to number of piles multiplied by individual pile .

iii) The bottom plug in a foundation well is usually made of

a) brick masonary

b) reinforced cement concrete

c) cement concrete

d) none of these.

iv) Negative skin friction occurs

a) when settlement of soil is more then pile settlement

b) when settlement of pile is more than soil settlement

c) When they are equal

d) cannot be predicted.

v) Terzaghi bearing capacity equation, $q_u = cN_c + qN_q + 0 \cdot 5\ \gamma\ B\ N_\gamma$ is applicable for

a) square footing and general shear failure

b) strip footing and general shear failure

c) square footing and local shear failure

d) strip footing and local shear failure.

vi) Skemton's bearing capacity equation is used in

a) cohesionless soil b) cohesive soil

c) C– ϕ soil d) None of these.

vii) In pure clayey soil, Terzaghi's bearing capacity factors N_c, N_q, N_γ respectably are

a) 5·7, 1·0, 0·0 b) 0·0, 1·0, 5·7

c) 0·0, 5·7, 1·0 d) 1·0, 0·0, 5·7.

viii) Example of ground improvement technique is

a) SPT b) soil nailing

c) scouring d) none of these.

ix) The type of sampler used in standard penetration test is

a) piston sampler b) split spoon sampler

c) both (a) and (b) d) none of these.

x) Which one is *in situ* test in soil exploration ?

a) DCPT b) Triaxial test

c) Direct shear test d) Hydrometer test.

xi) The maximum settlement in isolated footing sandy soils should be limited to

a) 25 mm b) 50 mm

c) 65 mm d) None of these.

xii) In sand having relative density of 50%, the type of bearing capacity failure will be

a) general shear failure b) local shear failure

c) punching shear failure d) unpredictable.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. a) State the assumptions of Terzaghi's bearing capacity theory.

b) Calculate the safe bearing capacity on a medium sand layer for a footing 2 m × 2 m located at a depth of 0·8 m $\gamma = 16{\cdot}5 \text{ kN/m}^3$, $\phi = 30^\circ$, $N_y = 19 \cdot 7$, $N_q = 22 \cdot 7$.

Take factor of safety = 3. 2 + 3

3. a) Classify piles on the basis of the method of installation.

   b) A single acting steam hammer weighing 2400 kg and falling through a height of 1 m drives a pile to an average penetration of 0·75 cm under the last few blows. What will be the allowable pile load ? 2 + 3

4. Briefly describe standard penetration test and illustrate the correction for *N*-value.

5. What are the different ground improvement techniques ? Briefly illustrate any one of them. 2 + 3

6. What are the factors affecting bearing capacity ?

7. a) What is a cassion ?

   b) What are its types ?

   c) What are the common types of well shapes ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. A strip footing 2m wide carries a load intensity of 400 kN/m^2 at a depth of 1·2 m in sand. The saturated unit weight of sand is 19·5 kN/m^3 and unit weight above water table is 16·8 kN/m^3. The shear strength parameters are e = 0 and ϕ = 35°. Determine factor of safety w.r.t. shear failure for the following locations of water table :

   a) Water table at 1·2 m below GL.

   b) Water table at 2·5 m below GL.

   c) Water table at 0·5 m below GL.

   d) Water table at ground level itself.

9. a) What is the sequence of operation of soil exploration ? 5

   b) In which case would you recommend a combined footing ? 5

   c) Discuss the effect of bearing capacity subjected to eccentric loading. 5

10. a) In which case would you recommend a well foundation ? 2

   b) Draw a neat sketch of a well foundation showing the various components. 7

   c) Give IRC recommendations for determining thickness of staining of wells. 3

   d) Indicate various steps of well sinking. 3

11. a) Why does problem arise when a foundation is placed on expansive soil ? 5

   b) A raft foundation is supported by a pile group consisting of 15 piles arranged in 3 rows. The diameter and length of each pile are 500 mm and 15 m respectively. The spacing between the piles is 1·25 m. The foundation soil consists of soft clay layer having $c = 3{\cdot}2\ t/m^2$, $\phi = 0$ and $\gamma = 1{\cdot}9\ t/m^3$. Determine the efficiency of the pile group. 10

12. a) What are the various phases of a sub-soil exploration programme ? Briefly explain them. 5

b) Distinguish between representative and undisturbed samples. 3

c) Explain the principle of SCPT. 2

d) Draw a typical cutting edge of a sampler and explain inside clearance, outside clearance and area ratio. 5