



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(CE)/SEM-7/CE-703/2011-12

2011

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) Negative skin friction is
 - a) upward friction acting on a pile
 - b) downward drag action acting on a pile
 - c) a combination of both (a) and (b)
 - d) none of these.
- ii) The no. of blows for SPT will be
 - a) for the 1st 150 mm penetration
 - b) for the next 300 mm penetration
 - c) addition of (a) and (b)
 - d) none of these.



iii) After correction standard penetration value is equal to

- a) $10 + \frac{1}{2}(N - 15)$ b) $15 + \frac{1}{2}(N - 15)$
- c) $20 + \frac{1}{2}(N - 15)$ d) $30 + \frac{1}{2}(N - 15)$.

iv) N value for loose sand is

- a) 4 b) 8
- c) 10 d) 12.

v) Chunk sampling is the process of

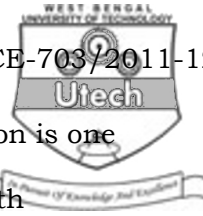
- a) disturbed sampling b) undisturbed sampling
- c) both (a) and (b) d) water sampling.

vi) The ultimate bearing capacity of a pile is

- a) ultimate skin friction
- b) ultimate point bearing resistance
- c) both (a) and (b)
- d) none of these.

vii) In sand having RD 50% the type of bearing capacity failure will be

- a) general shear failure
- b) local shear failure
- c) punching shear failure
- d) unpredictable.



- viii) According to IS 6403 a shallow foundation is one
- a) whose width is greater than its depth
 - b) whose depth is greater than its width
 - c) whose depth is equal to width
 - d) none of these.
- ix) Maximum centre to centre spacing of friction piles (D) as per BIS code
- a) 1.5 D
 - b) 2 D
 - c) 2.5 D
 - d) 3 D.
- x) A good quality undisturbed soil sample is one which is obtained using a sampling tube having an area of
- a) 8%
 - b) 16%
 - c) 24%
 - d) 32%.
- xi) Mechanical stabilization of soil is done with the help of
- a) cement
 - b) lime
 - c) bitumen
 - d) proper grading.
- xii) Due to negative skin friction on a pile, its load carrying capacity
- a) increases
 - b) decreases
 - c) unaffected
 - d) cannot be said.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following

3 × 5 = 15

2. Determine the width of a strip footing to carry a load of 800 kN/m at a depth of 1.5 m in a $c-\phi$ soil having a unit weight of 18 kN/m³ and shear strength parameters as $c = 20$ kN/m² and $\phi = 25^\circ$. For $\phi = 25^\circ$, the values of bearing capacity factors may be taken as $N_c = 20.72$, $N_q = 10.66$ and $N_\gamma = 10.88$.

3. What will be the gross and net safe bearing pressure of sand having $\phi = 36^\circ$ and effective unit weight of 18 kN/m³ under the following cases ?

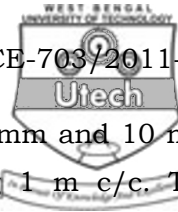
- i) 1 m wide strip footing
- ii) 1 m × 1 m square footing

Consider that the footing is placed at a depth of 1 m from the ground surface and the water table is at a depth of 2 m from the base of the footing. Factor of safety is 3 and the bearing capacity factors are $N_q = 47$ and $N_\gamma = 43$.

4. Discuss with suitable illustration the field situation where use of geotextiles may be beneficial as a method of ground improvement.

5. Derive the expression for consolidation settlement

$$S_c = \frac{C_0}{1 + e_0} \log \frac{\sigma_0 + \Delta \sigma}{\sigma_0} H \text{ where symbols have usual meaning.}$$



6. A group of 20 piles each having a dia of 40 mm and 10 mm long are arranged in 4 rows at a spacing 1 m c/c. The capacity of each pile is 380 kN. Determine the group capacity of the pile.
7. The results of two plate load tests performed on a given location with two circular plates are given below :
- Diameter = 750 mm, $S = 15$ mm , $Q = 150$ kN.
 - Diameter = 300 mm, $S = 15$ mm , $Q = 50$ kN.
- Determine the load on a circular footing of 1.2 m diameter that will cause a settlement of 15 mm.

GROUP – C

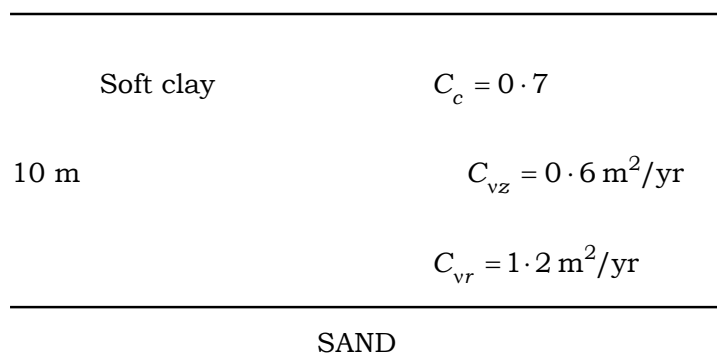
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. A 15 m long 300 mm diameter pile is to be driven in a uniform sand deposit having $\phi = 40^\circ$. The water table is at a great depth and not likely to rise. The average dry unit weight of sand is 18 kN/m^3 . Taking Berezantav's value of $N_q = 137$, calculate the safe load capacity of the pile with a factor of safety of 2.5.
9. A reinforced concrete pile 500 mm \times 500 mm and 15 m long is to be driven in cohesionless soil by a 5 tonne hammer with a fall of 2 m. Determine the set to be specified if it is to have a safe capacity of 120 tonnes.
- Assume the pile is finally driven with a follower of 0.2 tonnes. Driving is done without dolly or helmet but with a cushion on the top of the pile. Assume $f_{ck} = 2 \text{ N/mm}^2$. Assume any other value if needed.



10. a) Write down the different stages of site investigation for a major Civil Engineering project.
- b) Describe a stress bulb.
- c) What do you mean by significant depth ? 10 + 3 + 2
11. Write short notes on any *three* of the following : 3 × 5
- a) Vibrofloatation
- b) Stone columns
- c) Sand drains
- d) Curtain grouting
- e) Plate load test.
12. For the soil profile shown in figure below compute :
- a) the time for 90% consolidation of the soft clay without sandwicks. $T_{90} = 0.848$
- b) the time for 90% consolidation with sandwicks.





Given that the spacing of sandwicks is 1 m on a triangular grid and the dia of the sandwicks is 100 m.

Relation between Average degree of consolidation (U_r %) and Time factor (T_r) are given below :

Avg. degree of consolidation (U_r %)	Time factor (T_r)		
	$R/r_0 = 5$	$R/r_0 = 10$	$R/r_0 = 20$
10	0.012	0.012	0.030
20	0.026	0.044	0.063
30	0.042	0.070	0.101
40	0.060	0.101	0.144
50	0.081	0.137	0.195
60	0.107	0.180	0.258
70	0.137	0.231	0.330
80	0.188	0.317	0.453
90	0.270	0.455	0.649

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