ADVANCED FOUNDATION ENGINEERING (SEMESTER - 8)

CS/B.Tech(CE-NEW)/SEM-8/CE-801/4/09
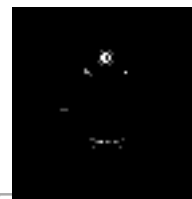
1. ....
   Signature of Invigilator

2. ....
   Signature of the Officer-in-Charge

Reg. No.

Roll No. of the Candidate

CS/B.Tech(CE-NEW)/SEM-8/CE-801/4/09
ENGINEERING & MANAGEMENT EXAMINATIONS, APRIL – 2009
ADVANCED FOUNDATION ENGINEERING (SEMESTER - 8)

Time : 3 Hours]   [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
    b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

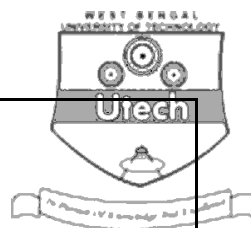### No additional sheets are to be used and no loose paper will be provided

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FOR OFFICE USE / EVALUATION ONLY
Marks Obtained

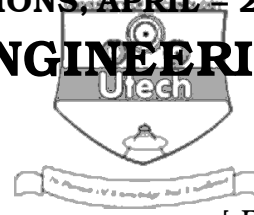| Question Number	Group – A										Group – B			Group – C			Total Marks	Examiner's Signature
Marks Obtained																		

....
Head-Examiner/Co-Ordinator/Scrutineer

8808-4/5 (20/04)

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ENGINEERING & MANAGEMENT EXAMINATIONS, APRIL – 2009

ADVANCED FOUNDATION ENGINEERING

SEMESTER - 8

Time : 3 Hours]

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(*Use of relevant codes are permitted*)

GROUP – A

(Multiple Choice Type Questions)

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

    i)   The static cone penetration test and a standard penetration test are performed on a soil at certain depth. The value of static cone penetration test is 8 MP_a and the *N* value is 20. The soil met at that depth is

        a)   sandy silt   b)   clay-silt mixture

        c)   sand and gravel mixture   d)   medium dense sand.

    ii) The gross bearing capacity of a footing is 450 kN/m^2. If the footing is 1·5m wide at a depth of 1m in clayey soil with unit weight of 20 kN/m^3, then the net bearing capacity (in kN/m^3) will be

        a)   400   b)   430

        c)   435   d)   440.

    iii) For undisturbed sampling, the area ratio for a thin wall sampler should not normally exceed

        a)   15%   b)   25%

        c)   30%   d)   35%.
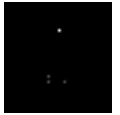
iv) Minimum centre to centre spacing of friction piles of diameter (D) per BIS code is

    a)   1·5 D   b)   2 D

    c)   2·5 D   d)   3 D.

v) A raft of 6 m ∞ 9 m is founded at a depth of 3 m in a cohesive soil having $C = 120$ kN/m^2. The ultimate net bearing capacity of the soil using Terzaghi's theory will be nearly

    a)   820 kN/m^2 b)   920 kN/m^2

    c)   1036 kN/m^2 d)   1067 kN/m^2 .

vi) Rise of water table in cohesionless soils upto ground surface reduces the net ultimate bearing capacity approximately by

    a)   25%   b)   50%

    c)   75%   d)   80%.

vii) The maximum differential settlement in isolated footings on clayey soils should be limited to

    a)   25 mm   b)   40 mm

    c)   65 mm   d)   100 mm.

viii) The value of bearing capacity factor for cohesion Nc, for piles as per Meyerhoff is taken as

    a)   6·2   b)   9·0

    c)   5·14   d)   5·17.

ix) Given, that damping ratio = 0·10 and damping coefficient = 225 kN sec/m, the critical damping coefficient in kN sec/m will be

    a)   22·5   b)   225

    c)   2250   d)   22500.

x) Degree of freedom of a block type machine foundation is

a) 2

b) 3

c) 4

d) 6.

xi) Given that $c = 2t/m^2$, $\phi = 0°$ and $\gamma = 2t/m^3$, the depth of tension crack developing in a cohesive soil backfill would be

a) 1 m

b) 2 m

c) 3 m

d) 4 m.

xii) No tension should develop at the base of rectangular well foundation or at any horizontal section within the well. For No tension at the base, the resultant of 'Pa' (Total active thrust) and 'W' (weight of soil and well above the base) must pass through middle

a) half of the base

b) third of the base

c) quarter of the base

d) of the base.

xiii) A retaining wall retains a sand strata with $\phi = 30°$ upto its top. If a uniform surcharge of $12t/m^2$ is subsequently put on the sand strata, then the increase in the lateral earth pressure intensity on the retaining wall will be
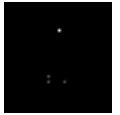
a) lt/m^2

b) $2t/m^2$

c) $4t/m^2$

d) $8t/m^2$.

xiv) A cantilever sheet pile drives its stability from

a) lateral resistance of soil

b) self weight
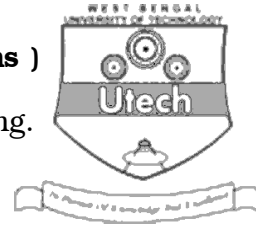
c) the deadman

d) the anchor rod.

GROUP – B

(Short Answer Type Questions)

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

2. Write short notes on any one of the following :

a) Stabilisation of bore holes.

b) Advantage of using steel sheet piles.

3. What is a 'Bore log' ? Sketch a typical 'Bore log'.

4. What is raft footing ? Under what circumstances is it required ?

5. Discuss the difference between static cone penetration test and standard penetration test.

6. Elaborate the advantages and disadvantages of pneumatic caissons over open caissons.

7. Discuss about the negative skin friction and effect thereof on the piles.

8. How will you determine which type of footing will you provide for a type of soil ?

GROUP – C

(Long Answer Type Questions)
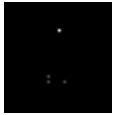
Answer any *three* of the following. 3 × 15 = 45

9. Describe with neat sketches how the depth of exploration and lateral extent of exploration for different kind of foundations considered and finalised for execution.

10 + 5

10. Discuss standard penetration test. What are the various corrections ? What is the importance of the test in geotechnical engineering ? 6 + 6 + 3

11. a) State the limitation of Terzaghi's theory in predicting the bearing capacity of a shallow foundation footing on a cohesive deposite.

b) A footing of 2 m square is laid at a depth of 1·3 m below the ground surface. Determine net ultimate bearing capacity using IS Code method. Given

$\gamma = 20 \text{ kN/m}^3$, $\phi' = 30°$, $c' = 0$, $N_c = 30·14$, $N_q = 18·4$, $N_\gamma = 22·40$, $S_c = 1·3$,

$S_q = 1·2$ and $S_\gamma = 0·80$.　　　　　　　　　　　　　　　　　　　5 + 10

12. a) Briefly describe the effects of the following factors on the ultimate bearing capacity of a footing :

   i)   Width of the base

   ii)   Unit weight of soil.

b) Explain with reference to neat sketches, any suitable method of taking into account the effect of eccentricity of loading on the bearing capacity of a footing.

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　5 + 10

13. a) Describe the steps in checking the stability of a retaining wall.

b) A vertical retaining wall has to retain a horizontal backfill upto a height of 7·0 m above G.L. The properties of this backfill are as follows :
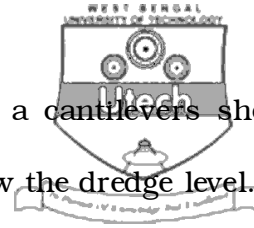
   From G.L. to 3·0 m : $\phi = 32°$, $\gamma = 1·8 \text{ t/m}^3$

   From 3·0 m to 7·0 m : $\phi = 33°$, $\gamma = 1·83 \text{ t/m}^3$

   Draw the active earth pressure diagram for the wall. Determine the resultant pressure and its point of application.

14. a) What are the different types of cofferdam ?

b) Derive the expression for embedment depth of a cantilevers sheet piling wall having granular soil above and cohesive soil below the dredge level.

c) Compute the depth of embedment and tension in the anchor rod for an anchored bulkhead of height 6·2 m to ratain a backfill having the following properties :

$\gamma = 18·5$ kN/m^3, $\gamma_{sat} = 20$ kN/m^3, $\phi^l = 30°$. The water table is at 1·5 m below G.L. and the anchor rod is at 1·0 m below G.L. Soil below the dredge level may be assumed to have the same properties as above. 2 + 3 + 10

15. a) A concrete pile 30 cm diameter is driven into a medium dense sand ($\phi = 35°$, $\gamma = 21$ kN/m^3, $K = 1·0$, $\tan \partial = 0·70$) for a depth of 8 m. Estimate the safe load, taking a factor of safety of 2·50.

b) Determine the natural frequency of a machine foundation having a base area 2 m ∞ 2 m and a mass of 15 MT, including the mass of the machine.

Taking $C_u = 4 \infty 10^4$ kN/m^3. 10 + 5

END