Total No. of Questions : 12]

SEAT No. :

**P1516**

[Total No. of Pages :4

# [4759] - 17
## B.E. (Civil)
## ADVANCED FOUNDATION ENGINEERING
### (Elective - III) (2008 Pattern) (Semester - II)

*Time : 3 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Your answers will be valued as a whole.***
5) ***Use of electronic pocket calculator is allowed & IS codes & IRC codes are not allowed.***
6) ***Assume suitable data, if necessary.***

## SECTION - I

***Q1)*** a) Explain the following: **[10]**

i) IS - 1892-1979 provisions for subsoil explorations.

ii) Significant depth & its guide rules.

b) Discuss in brief different case studies for failures of foundation. **[7]**

OR

***Q2)*** a) Discuss the 'Geophysical Methods' in detail according to IS-1892-1979. **[9]**

b) Discuss IRC provisions for number of borings & different guidelines, for depth of exploration. **[8]**

***Q3)*** a) A square footing of 1.5M size, rests at a depth of 1.5M in 4.5M deep, saturated clay. The clay is Nc with qu = 70 kPa, LL = 60%, $r_{sat}$ = 22 KN/$m^3$, W = 40% & G = 2.7. Determine the safe load, which the footing can carry with a FOS = 3 against shear. Also determine the settlement. Use, Nc = 5.7, Nq = 1 & Nr = 0. **[9]**

b) Compare the following for Raft foundation design, **[8]**

i) Conventional Method.

ii) Soil line method.

OR

***P.T.O.***

***Q4)*** a) Explain the steps for 'Hansen's Method' for shallow foundation design, subjected to inclined loads. **[9]**

b) Discuss various softwares used for Geotechnical designs & explain 'Geo-slope'. **[8]**

***Q5)*** a) How will you determine 'Qa' from a cyclic pile load test? Explain by drawing a sample graph. **[6]**

b) A square concrete pile, 30 cm in size & 5M long, subjected to a horz. load of 5 KN & a moment of 4 KN-m at GL. E = $3.1 \times 10^6$ N/cm$^2$ & $\eta_h$ = 20 N/cm$^3$. Determine the following. **[10]**

i) Total deflection

ii) Total slope

iii) Total moment

iv) Total shear

v) Total soil Reaction.

Assume pile head free & use following coefficients, z = 0.

| Ay | As | Am | Av | Ap |
|---|---|---|---|---|
| 2.435 | –1.623 | 0.000 | 1.000 | 0.000 |
| By | Bs | Bm | Bv | Bp |
| 1.623 | –1.750 | 1.000 | 0.000 | 0.000 |

OR

***Q6)*** a) What is LLP? How Es, T & $\eta_h$ is determined for a LLP? **[8]**

b) Explain stepwise the 'Reese & Matlock' method. **[8]**

## SECTION - II

***Q7)*** a) A clay layer 5M thk is consolidated with the help of sand drains of 30 cm $\phi$, spaced at 2.7 M c/c. Determine the influence of the drain wells on the Av. degree of consolidation at the time when the degree of consolidation in the clay without wells (Uz) would be 20%. Assume square pattern & compute the improvement in U, for the following cases,

i) Kr = Kz

ii) Kr = 5 Kz

Use following data;

| | |
|---|---|
| for Uz = 20%, | Tv = 0.031 |
| Tr = 0.070 | U = 30% |
| Tr = 0.085 | U = 35% |
| Tr = 0.373 | U = 85% |
| Tr = 0.455 | U = 90% |

**[10]**

b) Explain the methods for determination of LCC of 'Under-reamed pile'. for following cases, **[7]**

i) Clayey soil.

ii) Sandy soil.

OR

***Q8)*** a) Explain the steps for design of 'Sand-drains'. **[9]**

b) Discuss the following tests for 'Under-reamed piles' as per IS-2911-Pt-III-1973, **[8]**

i) Initial test.

ii) Routine test.

***Q9)*** a) Explain the design provisions for, **[8]**

i) Well curb.

ii) Cutting edge.

iii) Staining thickness.

iv) Bottom plug.

b) Discuss the following: **[9]**

i) NSD as per IRC.

ii) Lacey's criteria for NSD & grip length.

OR

***Q10)***a) Explain 'Banerjee & Gangopadhyay Analysis'. **[9]**

b) Discuss the provisions made as per IRC for Caisson design. **[8]**

***Q11)***a) Differentiate clearly between 'Rockfill cofferdam' & 'Cellular cofferdam' w.r. to design & construction. **[8]**

b) Explain the steps for the design of 'Anchored sheet pile' using 'Free Earth Support' method. **[8]**

OR

***Q12)***a) Discuss common types of 'Cofferdam' construction. **[8]**

b) Compute the embedment depth & pull in the anchor rod, for a sheet pile cofferdam of 6M high, retaining soil as a back fill & soil below dredgeline is same with following properties,

$\phi = \phi' = 30^{o}$, C = 0, $r_{sat}$ = 22 KN/$m^3$, r = 19 KN/$m^3$. Anchor rod is 1m below the top. GWT = 3M above the D.L. Use 'Free Earth Support' Method. **[8]**