EX/CON/T/321/2018

BE Constrn. Engg. Third Year Second Semester Examination – 2018

Subject: **Foundation Systems (Part I)**

Time : Three hours

Full Marks: 100

Different parts of the same question should be answered together.

CO4 [25]

Answer any **one(1) from (a) and (b)** *in this block:*

[1] (a) (i) Classify piles based on method of construction as well as pile material.

(ii) What do you mean by negative skin friction?

(iii) Given below is the details of sub-soil profile of a site.

Strata No.	Soil stratification	Type of Soil	Thickness (m)	Design Parameter		Bulk Density, T/m^3
				c_u T/m^2	ϕ_u	
I	Soft brownish grey silty clay	c	2.1	2.8	0.0	1.82
II	Soft grey/dark grey Silty Clay	c	6.7	2.9	0.0	1.73
III	Stiff bluish grey Silty Clay	c	5.3	7.5	0.0	1.89
IV	Dense yellowish brown silty clay	phi	6.9	0.0	30	1.90

The water table may be assumed to be located at the ground surface. Determine the safe vertical load carrying capacity of a 600mm diameter bored cast-in-situ pile having cut-off level at a depth of 1.5m below ground level. What should be the length of the pile?

Use of relevant IS code is allowed.

[5+5+15]

(b) (i) Briefly explain some of the important pile driving formulae explaining the meanings of the various terms.

(ii) A timber pile 18cm in diameter at the tip and 30cm in diameter at the butt is driven 7.5m into the ground. The weight of the pile and driving cap is 700kg and the weight of the drop hammer, which is released by a trip is 900 kg. The hammer falls through 3m. The average penetration of the pile under the last few blows of the hammer is 1cm. Determine the vertical load carrying capacity of the pile.

[10 + 15]

CO5 [25]

Answer any **two(2) from (a) and (b)** *from this block:*

[2] (a) (i) Distinguish between individual capacity and group capacity of piles. What do you mean by efficiency of pile group?

(iii) Write down the expression for determining the group efficiency by Converse-Labarre eqn. showing necessary sketch and explaining all the terms.

(iv) Compute the efficiency of the group of friction piles shown in Fig.1 by the Converse-Labarre eqn. Assume D = 400 mm and spacing s= 1000 mm (bothways) and all cohesionless material in the pile embedment zone.

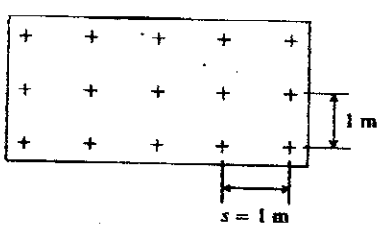

Figure 1

[10+ 5 + 10]

(b) (i) What is sinking of wells?

(ii) What are the special arrangements to be made for laying the cutting edge on the river bed some depth of water?

(iii) Determine the silt factor from the following data.

Sieve Size (mm)	Weight of soil retained (gm)
4.00	0
2.00	16.2
1.18	76.5
0.425	79.2
0.150	150.4
0.075	41.0
Pan	55.4

[5 + 10

CO1: Describe different types of foundation (K1)
CO2:Explain shear and settlement failure of foundation(K2)
CO3:Calculate different types of bearing capacity for shallow foundation (K3)
CO4:Calculate pile load capacity including negative skin friction and illustrate various dynamic formulae (K3)
CO5: Illustrate pile group capacity, sinking of wells and compute scour depth.(K3)

FOUNDATION SYSTEM PART-II FULL MARKS: 50

Answer either Question [2 (a) (i) + 2 (a) (ii)] or Question [2 (b) (i) + 2 (b) (ii)] and

Similarly answer either Question [3 (a) (i) + 3 (a) (ii)] or Question [3(b) (i) + 3 (b) (ii)]

Different part of the same question should be answered together. [Assume relevant data if required]

No code is allowed in examination hall.

CO-1.

Q-1. (a) Describe different types of shallow foundation with neat sketch. Illustrate comparative advantage and disadvantage of different types of shallow foundation. (7)

CO-2 (a) (i) Describe the limitations of plate load test for determination of bearing capacity of soil.(8)

(ii) Explain the method of estimation of settlement using static cone penetration data. (7)

OR

(b) (i) Describe Skempton's method for estimation of bearing capacity (7)

(ii) Explain the significance of different correction factors in relation to estimation of settlement. (8)

CO-3

Q-3.(a) (i) Design three isolated RCC footings with zero differential settlement , which are carrying axial loads of 40 ton , 50 ton and 45 ton spaced @ 4m c/c . The footings are to be placed in a subsoil with C= 3 t/ m^2 , γ = 1.84 t/m^3 , m_v = 0.0035 m^2 /t . (15)

AND

(ii) If the width of all the footings are considered as 2.5 m with the same spacing , find out the differential settlements and angular distortion for the respective footings and make comments on its acceptability with respect to the permissible limit as stated in relevant code. (13)

OR

Q-3(b) (i) Calculate net ultimate safe bearing capacity of a rectangular footing [2m X 3m] with a depth of 1.2 m below existing ground level. The load on footing was found to act an angle of 15^0 to the vertical and is eccentric in the direction of width by 14 cm. The ground water table at proposed site was at 1.5 m below base of the footing. The rate of loading is slow and therefore the effective stress shear strength parameters may be used in the analysis. The soil properties are as following . (14)

$C' = 15$ KN / m^2 , $\gamma_{sat} = 18$ KN /m^3 , $\phi' = 25^0$.

For , $\phi' = 25^0$. $N_q = 10.66$ $N_\gamma = 10.88$

For , $\phi' = 20^0$. $N_q = 6.4$ $N_\gamma = 5.39$

For , $\phi' = 15^0$. $N_q = 3.94$ $N_\gamma = 2.65$

AND

Q-3(b) (ii) Design a raft foundation of size [12m X 20m] in a subsoil as described in question 2(a) (i) for a B+G+5 storied building. Calculate the degree of compensation for the proposed raft. (14)