Ref. No.: Ex/CON/PC/B/T/322/2024

B.E. CONSTRUCTION ENGINEERING THIRD YEAR SECOND SEMESTER

EXAM 2024

SUBJECT: FOUNDATION ENGINEERING

Time : Three hours (50 Marks for each Part) Full Narks : 100

Use separate answer script for each Part

PART I (50 Marks)

Answer any two questions

Assume relevant data wherever required

Q-1. Determine the size of footings which are carrying axial loads of 30t , 35 t and 40t in a clayey deposit at a depth of 1m below existing ground level with C = 3 t/m^2 , $m_v = 0.0035\ m^2/t$, so that there will be no differential settlement between the footings. [14] CO2

(b) Describe the factors on which allowable differential settlement of foundation can vary. [5] CO2

© Explain why allowable limit of differential settlement is enforced in foundation design . [4] CO2

(d) what is the code number in which provision of allowable limit of differential settlement has been recommended. [2] CO2

Q-2 (a) Describe the soil properties by which different types of shear failure can be classified . [5] CO1

(b) Determine the depth of a raft foundation for a B + G+ 6 storied building [15m X 25m] in a subsoil as marked in Q-1(a) . Calculate the degree of compensation of the raft . [15] CO3

© Explain the advantage and disadvantage of a raft with backfilling. [5] CO1

Q-3 (a) Design a strip and square footing for a four storied building in a subsoil with C= 1.5 t/m^2 , $\phi = 22^0$, $\gamma = 1.86\ t/m^3$ $m_v = 0.0032\ m^2/t$ [18] CO3

Φ	N_c	N_q	$N\gamma$
25	20.72	10.66	10.88
20	14.83	6.40	5.39
15	10.98	3.94	2.65

(b) Describe the correlations from which settlement and bearing capacity of soil can be estimated using field data. [7] CO3

[Turn over

(50 Marks)

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Part - II (50 Marks)

Answer Q.1 and any ONE from Q.2 and Q.3

<table>
<tr><th></th><th>No. of Questions</th><th></th><th>Marks</th></tr>
<tr><td>CO4</td><td>Q.1a)</td><td>Determine the safe vertical load carrying capacity of a bored cast-in-situ pile for the soil stratification presented below. State clearly the length of the pile considered.

<table>
<tr><th>Description</th><th>Starting Elevation (m)</th><th>Ending Elevation (m)</th><th>Angle of Internal friction (φ) (Degrees)</th><th>Cohesion (t/m²)</th><th>Bulk Density (t/m³)</th></tr>
<tr><td>Loose brownish grey silty sand</td><td>(-) 0.000 m</td><td>(-) 4.00 m</td><td>28</td><td>-</td><td>1.780</td></tr>
<tr><td>Medium dense grey silty sand.</td><td>(-) 4.00 m</td><td>(-) 10.00 m</td><td>30</td><td>-</td><td>1.810</td></tr>
<tr><td>Medium dense/dense greyish brown silty sand</td><td>(-)10.00 m</td><td>(-) 25.50 m</td><td>30</td><td>-</td><td>1.860</td></tr>
</table>
Groundwater level (-)1.550 m
Pile Diameter 0.500 m</td><td>15</td></tr>
</table>

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Part - II (50 Marks)

Answer Q.1 and any ONE from Q.2 and Q.3

	No. of Questions		Marks
		Pile Cut-off Level (-)1.500 m BGL Ground level (-) 0.000 m	
	Q.1b)	Assume suitable values of any other relevant data not provided.	5
	Q.1c)	What is the safe uplift capacity of the pile? Also calculate the safe lateral load capacity of the same pile by IS method.	10
CO5	Q.2.a)	Explain how skin friction and end bearing are separated in Cyclic Load test giving neat sketch.	7
	Q.2.b)	What is tilting of wells?	3
	Q.2.c)	Calculate the maximum scour depth considering the silt factor from the data given below. Consider the discharge to be 150 cumecs per m. width.	10

Sieve size (mm)	Wt. of soil retained (gm)
4.000	0
2.000	15.2
1.180	75.6
0.425	78.9
0.150	151.2
0.075	39.4

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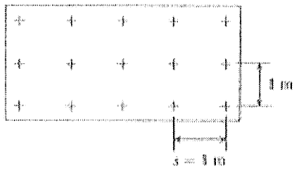
Part - II **(50 Marks)**

Answer Q.1 and any ONE from Q.2 and Q.3

	No. of Questions		Marks
		Pan 54.7	
	Q.3.a)	What do you mean by critical depth of piles? Explain citing the relevant clause of the code.	
	Q.3.b)	Compute the efficiency of the group of friction piles shown in the figure by the Converse-Labarre equation. Use D = 400mm, spacing s = 1000mm (bothways) and all cohesionless material in the pile embedment zone. Determine the group capacity using this efficiency as well as based on single pile capacity (=56 ton).	10
			10