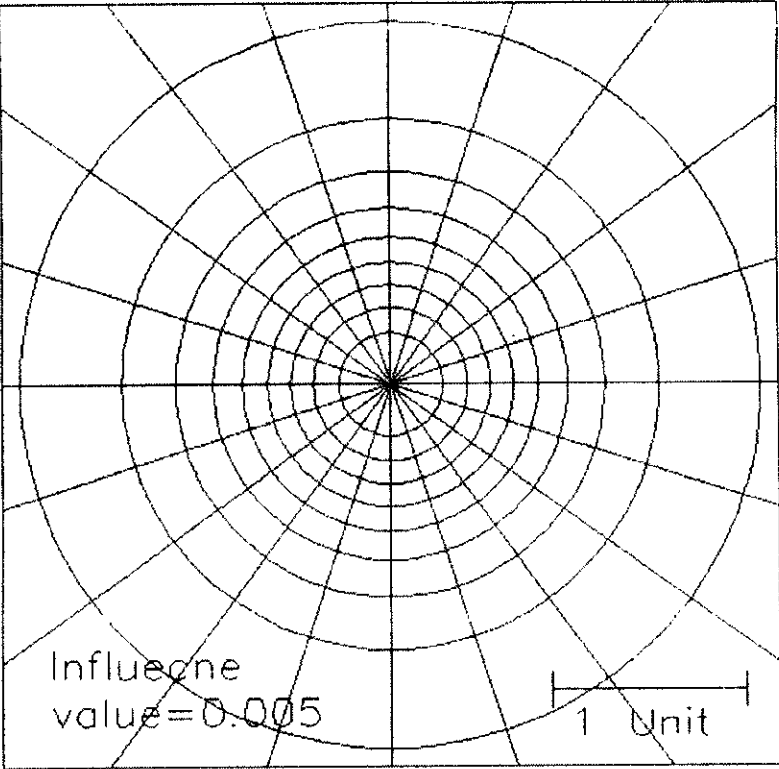


Ref No. – Ex/CE/T/414/2018

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION, 2018
 (4TH YEAR 1ST SEMESTER)
 (1ST / 2ND Semester / Repeat / Supplementary / Spl. Supplementary / Old / Annual / Biannual)
 SUBJECT: DESIGN OF FOUNDATION
 (Name in full)

Full Marks 30/100

Time: Two hours / Three hours / Four hours / Six hours

No. of Questions	PART I (60 marks)	Marks
	<i>Answer all questions</i>	
Q1 a)	Why factor of safety is applied on ultimate bearing capacity of soil? Give typical values of factor of safety.	5
b)	<p>Design a shallow foundation for a column load of 600 kN for the subsoil data given below:</p> <p>Stratum I : Depth 0 – 3.0m : Brownish grey silty clay / clayey silt $\gamma = 18.6 \text{ kN/m}^3$, $C_u = 40 \text{ kN/m}^2$, $C_c/1+e_0 = 0.11$, $p_c = 70 \text{ kN/m}^2$, $C_c'/1+e_0 = 0.04$</p> <p>Stratum II : Depth 4.0 – 15.0m : Dark grey silty clay / clayey silt with decomposed wood $\gamma = 16.5 \text{ kN/m}^3$, $C_u = 15 \text{ kN/m}^2$, $C_c/1+e_0 = 0.15$</p> <p>Stratum III : Depth 15.0 – 18.0m : Stiff / very stiff bluish / mottled brown silty clay / clayey silt with rusty spots $\gamma = 19.5 \text{ kN/m}^3$, $C_u = 75 \text{ kN/m}^2$, $C_c/1+e_0 = 0.09$</p> <p>Stratum IV : Depth > 18.0m till 35.0m : Dense / very dense sand $\gamma = 20 \text{ kN/m}^3$, $\phi = 36^\circ$</p> <p>Ground water table at a depth of 1.0m below G.L.</p> <p>Use Newmark's chart given below for determining vertical stresses below foundation. Assume reasonable values of data not given.</p>	15
	 <p style="text-align: center;">Influence value = 0.005</p> <p style="text-align: center;">1 Unit</p>	

Time: ~~Two hours~~/Three hours/~~Four hours~~/ Six hours

No. of Questions	PART I (60 marks)		M
Q2	<p>Two raft foundations of size 15m x 20m and 20m x 25m are to be constructed in the subsoil deposit as given in Q1(b) at a depth of 1.5m below ground level. Average foundation pressures for the rafts are 60 and 50 kN/m² respectively. The distance between the outer edges of the raft is 5m.</p> <div style="text-align: center;"> </div> <p>a. Draw the stress distribution diagram on the horizontal planes through the midpoint of stratum I, II and III.</p> <p>b. Calculate the differential settlement and also the corresponding tilt of the rafts (along A-B and C-D).</p> <p style="text-align: center;">Use Newmark's chart as given in Q1(b).</p>	20	
Q3 a)	<p>A raft foundation is to be constructed for a multistoried building with a total column load of 50000 kN. Size of the raft is 25m x 20m. Use soil data given in Q1(b). Design the raft foundation considering the following aspects:</p> <ol style="list-style-type: none"> Depth of foundation Bearing capacity Settlement 	20	

B.E. CIVIL ENGINEERING FOURTH YEAR FIRST SEMESTER EXAM 2018
 (1st /2nd Semester/Repeat/Supplementary /Spl. Supplementary /Old/Annual/Bi-Annual)
SUBJECT: DESIGN OF FOUNDATION

(Name in full)

PAPER xxxx

Time: ~~Two hours~~ / Three hours / ~~Four hours~~ / ~~Six hours~~

Full Marks 30/100

Full Marks 100

(Part I: 60 Marks)

Part II: 40 Marks)

Question
No.Use a separate Answer-Script for each part
Part II (40 Marks)

Marks

- Assume reasonable data if it is not supplied.
- Answer any two questions
- IS Code 2911 (part 1 and 2) will be needed to answer the questions of this part

Q.1 A multistoried building is to be constructed at a site. the subsoil profile and properties are given as follows: 20

Layer	Description	Design Properties
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I	Firm brownish grey silty clay	0-6 Cu=40 kN/m ²
II	Soft dark grey silty clay	6-16 Cu=20 kN/m ²
III	Stiff bluish grey silty clay	16-19 Cu=80 kN/m ²
IV	Stiff bluish grey silty clay	19-35 $\phi = 35^\circ$

Compute the safe vertical, uplift and lateral load of 25m long RCC bored piles of 500mm, 650mm and 750mm diameters. Assume Water table at ground level and average bulk unit weight of soil is 19 kN/m³ and that at pile tip is 20 kN/m³.

Q.2 a) A typical column of a multistoried building carries a vertical load of 6500 kN, Horizontal moment about xx axis is 125 kN-m and yy axis is 115 kN-m under DL+LL condition respectively. The safe pile capacity= 1730kN considering appropriate pile spacing draw a suitable pile group with a pile cap and find load per pile. 10

b) A group of 9 piles with 3 piles in a row was driven into soft clay extending from finished ground level to a great depth. The diameter and length of the piles are 450mm and 15m respectively. The water table is at the top of clay layer and submerged unit weight of soil 9.4 kN/m³. Assume the clay to be normally consolidated with consolidated drained $\phi = 30^\circ$. Consider that the land is recently filled with 1.5m thick fill of unit weight 18 kN/m³. Estimate the negative skin friction effect of the pile group. 10

Q.3 a) A fully embedded precast prestressed concrete pile is 15m long and is driven into a homogeneous layer of sand ($c=0$, $\phi = 35^\circ$). The allowable working load is 338 kN, if 240kN is contributed by frictional resistance determine the elastic settlement of pile. $E_p=21 \times 10^6$ kN/m², $E_s=30000$ kN/m² and poisson's ratio of soil=0.3 [Ep and Es being modulus of elasticity of pile and soil respectively.] 10

b) A concrete pile having 30sq. cm cross sectional area and 10m long is subjected to a horizontal load of 5 kN and a moment of 4 kn-m at the ground level. Taking coefficient of subgrade modulus as 20 N/cm³, find the deflection and bending moment at ground level for free and fixed head conditions by REESE-MATLOCK METHOD. Given at GL $A_y=2.435$, $B_y=1.623$, $A_m=0.000$ and $B_m=1.000$. Also illustrate the principle of this method. 10