Ref No. Ex/CE/T/423C/2019

B.E. CIVIL ENGINEERING FOURTH YEAR
SECOND SEMESTER EXAM 2019
ADVANCED FOUNDATION ENGINEERING

Time: Three hours, **Full Marks:100**

Use a separate Answer-Script for each part

1. Answer *all questions*
2. *Assume reasonable values of data if it is not supplied.*
3. *No code is allowed*

No. of Question	Part I (60 Marks)	Marks
Q.1	A 5m x15m deep trench is excavated in medium dense sand for the foundation of a multistoried building with basement. The sides of the trench are supported with sheet pile walls fixed in place by struts and wales. The first row of strut is located at 2.5m below GL and bottom of cut is located at 2m below bottommost (2nd) row of strut. In each row horizontal spacing of strut is 2.5m centre to centre The soil parameters are as follows: 7= 19.5 kN/m^3, c = 25 kN/m^2 and $\phi = 0°$ Determine: (i) The pressure distribution on the walls with respect to depth .and (ii) the strut loads.(iii) Factor of safety against bottom heaving if N_c=6.7 and 7.2 for H/B=1 and 2 respectively and for L/B=3	20
Q.2a)	i) Why ground improvement is needed? Ii) What are ground improvement techniques for clayey soil?	3+3=6
b)	A 24m diameter x 15.5m high steel oil storage tank is proposed to be built at a site with a 1m thick sand pad with projection of Im on each side at base of the tank. The side slope of sand pad is 1:1The subsoil profile at the site consists of soft grey silty clay (γ=18kN/m^3, C_u=22kN/m^2, $C_c/1+e_0$=0.15) down to 12m below GL followed by stiff layer of bluish grey silty clay (γ=19kN/m^3, C_u=75kN/m^2, $C_c/1+e_0$=0.10) down to 15m below GL. The ground water table is near the ground surface. The formation level of the ground is to be raised by 2m thick sand fill prior to construction. The ground is to be treated by stone column of 500mm diameter with centre to centre spacing of 1m installed in triangular grid. Find the load bearing capacity of individual stone column, bearing capacity and settlement of treated ground. Take stress concentration ratio, n=4	20
Q.3 a)	What is 'Frequency Ratio' and what is its importance in design of machine foundation?	4
b)	A block of size 1.0 m × 2.0 m ×1 m high is undergoing vibration. The weight of motor and oscillator= 21 kN, vertical unbalanced force= 40 kN, C_u= 3× 10^{4}kN/ m^3, ξ= 0.25. Find the natural frequency of vibration and also the frequency for frequency ratio of 0.5. Then find the amplitude of vibration.	10

Form A: Paper-setting Blank

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B.E. CIVIL ENGINEERING FOURTH YEAR
SECOND SEMESTER EXAM 2019
(~~1st~~/2nd Semester/~~Repeat/Supplementary/Spl. Supplementary/Old/Annual/Bi-Annual~~)

SUBJECT: **ADVANCED FOUNDATION ENGINEERING**

(Name in full)

PAPER ××××

Time: ~~Two hours~~/ Three hours/~~Four hours/Six hours~~ **Full Marks ~~30~~/100**

(~~15~~/40 marks for this part)

Use a separate Answer-Script for each part

- *Maintain neatness and assume reasonable data if it is not supplied.*
- *Answer two questions,* All sketches-must be drawn by pencil

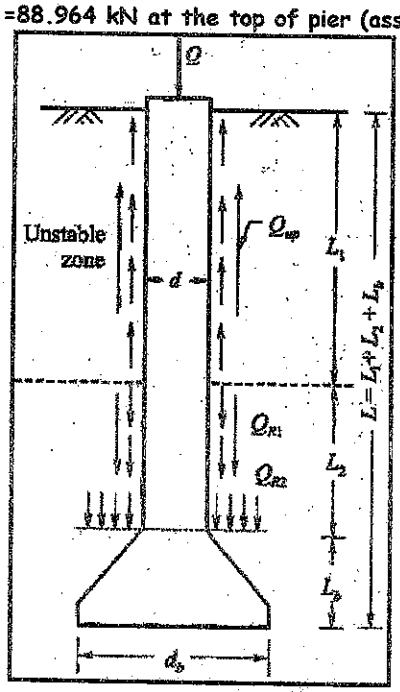
No. of Question — Marks

Part-II

(1) (a) What is the equation for uplift force Q_{up} for pier as per Chen (1988)? Explain with notations. 2

(b) What are the general characteristics of swelling soils? 7

(c) Here the figure shows a drilled pier [refer to Fig. shown] with a belled bottom in expansive soil. The water table is not encountered. The details of the pier and soil are: 8
L_1 = 3.05 m, L_2 = 3.05 m, L_b = 0.760 m, d= 0.305 m, d_b= 0.914 m, p_s = 478.80 kN/m^2, c_u = 95.76 kN/m^2, γ = 17.28 kN/m^3,
Required:
(a) total uplift force Q_{up}
(b) total resisting force Q_R,
(c) factor of safety for Q =0 at the top of pier,
(d) factor of safety for Q =88.964 kN at the top of pier (assume α= 0.55)



(d) Describe briefly (with the citation of chemicals used) how the expansive nature of soil, can be tested (generally) in laboratory? 3

(2) (a) When pumping tests are needed to be performed in the field? 3

(b) What information should a pumping test (field pumping test) report contain? 5

Or

Briefly discuss about the most common methods of dewatering in the field. Write short note on duration of the pumping test (field pumping test). Or 3+2

(c) How the pump water is discharged? 5

(Continued in Page 2)

Form A: Paper-setting Blank

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B.E. CIVIL ENGINEERING FOURTH YEAR
SECOND SEMESTER EXAM 2019
(~~1st~~/2nd Semester/~~Repeat/Supplementary /Spl. Supplementary /Old/Annual/Bi-Annual~~)
SUBJECT: ADVANCED FOUNDATION ENGINEERING
(Name in full)
PAPER ××××

Time: ~~Two hours~~/ Three hours/~~Four hours/Six hours~~ **Full Marks ~~30~~/100**
(~~45~~/40 marks for this part)

Use a separate Answer-Script for each part

(Continued from Page 1)

(d) 60 cm diameter well is being pumped @ 1360 litres/minute. Measurements in a nearby test well were made at the same time as follows: At a distance of 6 m from the well being pumped, the draw downs are 6 m and at a distance of 15 m from the well the draw downs are 1.5 m. The bottom of the well is 90 m below GW table. 2+2+3 =7

(a) Find out the coefficient of permeability,
(b) If all the observed points are on the Dupuit curve, what was the drawdown in the well during pumping?
(c) What is the specific capacity of the well?

(3) (a) Distinguish between open caisson and pneumatic caisson. 3

(b) Discuss briefly about the different shapes of the well. 3

(c) Enumerate the forces acting on a well foundation. 4

(d) A circular well of 4.5 m external diameter and 0.75 m steining thickness is embedded up to a depth of 13.5 m in a uniform sand deposit. The angle of shearing resistance of sand and the submerged unit weight are 29° and 1.0 t/ m^3 respectively. The well is subjected to a resultant horizontal force of 55 t and a total moment of 385 tm at scour level. Assuming the well to be light well, compute the allowable total equivalent resisting force due to earth pressure. A factor of safety of 2 may be adopted for soil resistance. Determine the magnitude and point of maximum bending moment in the well steining. What will be the change in computed values for a heavy well when the well is assumed to rotate about the base? 8+2

End