Form A: Paper-setting Blank *Ref No.* EX/CE/5/T/505A/2017(Old)

B.ECIVIL ENGG (Part Time) 5th YEAR SECOND SEMESTER. 2017 (Old)

(~~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~~/50 marks for each part)

Use a separate Answer-Script for each part

1. Answer All questions.
2. Assume reasonable values of data if not supplied.
3. No code etc. will be needed to answer the questions of this part

No. of Question — Part 1 — Marks

Q.1 A 4m x8m deep trench is excavated in medium dense sand for the foundation of a multistoreyed building.
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 1m below GL and bottom of cut is located at 2m below bottommost row of strut. The vertical spacing of strut is 2.5m and in each row horizontal spacing of strut is 3m centre to centre The soil parameters are as follows:
7= 18.5 kN/m3, c = 0 and ϕ = 38° 15
Determine: (a) The pressure distribution on the walls with respect to depth.(b) strut loads (c) maximum bending moment in sheet pile wall.

Q.2 a) What is coefficient of elastic uniform compression? Describe the experiment by which you can find it in the field. 10

b) A block of size 1.0 m × 2.0 m ×1 m high is undergoing vibration. The weight of motor oscillator= 2.1 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. Also find the amplitude of vibration 10

Q.3 The subsoil profile at a site is given in Table 1. The ground water table is near the ground surface. A 15m diameter x 13.5m high steel oil storage tank is proposed to be built at the site with a 1m thick sand pad with projection of l m on each side at base of the tank. The side slope of sand pad is 1:1. Consider 1st stage preloading with sand (γ=20 kN/m^3) with a height of 3m for ground improvement by sand wicks. Find the need of ground improvement from bearing capacity consideration and find settlement at tank centre before and after preloading. Also find the improved strength achieved due to preloading if the ratio of increase of undrained shear strength of the clay to the increment of surcharge load is 0.25

Table 1: Subsoil Profile:

Stratum	Description	Thickness (m)	*N-Value*	γ (kN/m^3)	C_u (kN/m^2)	$C_c/1+e_0$
I	Soft brownish grey silty clay.	2.50	4	18	30	0.14
II	Soft to very soft Dark grey silty clay with decomposed wood	7.50	2-3	17	20	0.16
III	Dense to very dense yellowish / dark brownish grey sandy silty clay	>5.10	40-64	20	100	0.10

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B. CIVIL ENGINEERING (PART TIME) FIFTH YEAR SECOND SEMESTER (Old) – 2017

ADVANCED FOUNDATION ENGINEERING

Time: Three Hours

Full Marks 100
Part I: 50 Marks
Part II: 50 Marks

Use Separate Answer-Scripts for each Part

Question No.	Part II (50 Marks)	Marks
	*Answer **ANY TWO** questions from this Part. Assume reasonable values of data, if not supplied. Use of IRC: 45 is allowed.*	
1. a)	Discuss the various forces acting on a well foundation with the help of a neat sketch.	5
b)	Derive the expression for obtaining equivalent resisting force due to earth pressure for a light well using Terzaghi's analysis.	5
c)	The following data refers to a well foundation for a single line railway bridge: a. Net downward load on well including self weight = 1400 t b. Horizontal force at scour level = 200 t c. Moment at scour level = 4150 t d. Depth of well below scour level = 15 m e. Saturated unit weight of sand = 2.0 t/m^3 f. Angle of shearing resistance of subsoil = 35^0 g. Angle of wall friction = 20^0 h. External diameter of well = 8.5 m i. Internal diameter of well = 5.5 m j. Allowable bearing pressure = 55.0 t/m^2 Check the lateral stability of the well as per the procedure laid down by IRC: 45. Take Coulomb's earth pressure coefficients, K_a = 0.25, K_p = 8.32.	15
2. a)	Derive the expression for discharge from a fully penetrating well in an unconfined aquifer.	10
b)	What is electro-osmosis? What are its advantages and disadvantages as compared with the conventional drainage systems?	5

B. CIVIL ENGINEERING (PART TIME) FIFTH YEAR SECOND SEMESTER (Old) – 2017

ADVANCED FOUNDATION ENGINEERING

Time: Three Hours

Full Marks 100
Part I: 50 Marks
Part II: 50 Marks

Use Separate Answer-Scripts for each Part

Question No.	Part II (50 Marks)	Marks
c)	During a recuperation test, the water level in an open well was depressed by 2.4 m which recuperated by an amount of 1.5 m in 60 minutes. Determine the yield from the well of 3 m diameter under a depression head of 3.0 m.	5
d)	A slot is made in an unconfined aquifer to drain water. The flow to the slot occurs from both sides. If the water table is at a height of 12 m above the base and the drawdown is 4 m, find the discharge per metre length, assuming that the distance of the slot from both sides is 100 m. Take $k = 5 \times 10^{-4}$ m/s.	5
3. a)	Define swelling potential. How would you classify expansive soils based on swelling potential?	2+3
b)	What are the various methods of modification of an expansive soil to improve its characteristics?	5
c)	A single under-reamed pile is installed in a soft clay deposit. The centre of the under-ream is located at a depth of 15 m from the ground surface. The diameters of the pile shaft and bulb are 1.0 m and 2.5 m respectively. If the depth of active zone is 3 m, determine the allowable load with a factor of safety 2.5. Assume adhesion factor for side friction = 0.9, undrained strength at the bulb = 130 kN/m^2, undrained strength at the base = 150 kN/m^2, and average undrained strength on shaft = 100 kN/m^2.	10
d)	Differentiate between Free swell and Differential swell.	5