Ref. No. Ex/PG/CE/T/111C/6/2017

MASTER OF CIVIL ENGINEERING EXAMINATION 2017
(1st Semester)

ADVANCED FOUNDATION ENGINEERING

Time: Three Hours

Full Marks 100
(Part I: 60 Marks
Part II: 40 Marks)

Use a separate Answer-Script for each part

Question No.	Part I (60 Marks)	Marks
	*Answer **ALL** questions from this Part.* *Assume reasonable values of data, if not supplied*	
1	A group of 9 piles with 3 piles in a row was driven into soft clay extending from ground level to a great depth. The diameter and length of the piles are 500mm and 10m respectively. The unconfined compressive strength of the clay is 60kPa. If the piles were placed with 1500 mm centre to centre distance a) Find the efficiency of the pile group for the given spacing and also for a centre to centre spacing of 1050mm. Also justify the change of efficiency. b) Also compute settlement of the group assuming coefficient of volume compressibility of the soil to be 0.05 cm^2/kg. Consider a very dense sand layer existing at a depth of 25m.	12+8= 20
2 a)	A 25 m long bored and cast-in-situ RCC pile having 75cm in diameter is to be constructed in a deposit of uniform sand. The sand has bulk unit weight is 1.95 t/m^3 and its corrected N value is 15. Find its lateral load bearing capacity under both fixed head and free end conditions corresponding to pile head deflection of 5mm.	10
b)	Assuming resonance to have occurred at a frequency of 32 cycles/ second during vertical vibration of a test block, 0.75m × 1.5m × 1.5 m high, determine the coefficient of elastic uniform compression (Cu). The weight of oscillator is 65 Kg. If the force produced by it at 20 cycles per second is 200 Kg, compute the maximum amplitude in vertical direction when vibration frequency is 20 cycles/ second. Also find the coefficients of elastic uniform compression (Cu) for prototype foundation sizes of 2m x 4m and 2m x 6m.	10
3 a)	A drilled pier was constructed in an expansive soil. The water table was not encountered. The following data are given. Depth of unstable Zone is 5m. Total shaft length is 10m., swelling pressure = 0.5 kg/cm^2, undrained shear strength= 0.35 kg/cm^2,SPT=6 blows per 30cm, Find the factor of safety both with and without dead load, if the dead load is 6tons.	10
b)	A bridge 120 m long, is to be constructed over a river having Qmax= 3200 m^3/s, HFL=+81.17m; LWL=+73.00 m and existing bed level=+ 72.00m. The subsoil consists of loose silty sand layer (Ncorr=10), 3.5 m thick, underlain by a thick stratum of medium to coarse sand (Ncorr=24). Determine normal and maximum depths of scour along with allowable bearing capacity of a 6.0m diameter abutment well providing proper depth of foundation. Given that the weighted mean diameter of the bed material down to relevant depth is 0.41 mm and permissible settlement is 50 mm. Use Teng's Formula.	10

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MASTER OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION, 2017
(1ST 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~~ ~~(15/30 marks for each part)~~

Use a separate Answer-Script for each part

No. of Questions	Part II (Marks:40)	Marks
Q1. a)	Draw a Newmark's chart used for estimation of vertical stress distribution in soils.	7
b)	Design an isolated column footing of size 3.0m x 3.0m is placed at a depth of 1.0 m below G.L. The subsoil profile and properties at the site are given below :	

Stratum	Description	Depth (m)	Average Properties
I	Brownish grey silty clay / clayey silt	0 - 3.00	Bulk density = 1.86 t/m^3 NMC = 31% Cu = 3.4 t/m^2 $C'_c/1+e_0$ = 0.05 p_c = 8t/m^2 $C_c/1+e_0$ = 0.15
II	Dark grey silty clay / clayey silt with organic matter and decomposed wood	3.00 – 14.00	Bulk density = 1.60 t/m^3 NMC = 45% Cu = 1.2 t/m^2 $C_c/1+e_0$ = 0.16
III	Stiff bluish grey silty clay / clayey silt with kankars	14.00 – 17.00	Bulk density = 1.90 t/m^3 NMC = 28% Cu = 6.5 t/m^2 $C_c/1+e_0$ = 0.12
IV	Very stiff mottled brown silty clay / clayey silt with rusty spots	17.00 – 20.00	Bulk density = 1.95 t/m^3 NMC = 25% Cu = 9.0 t/m^2 $C_c/1+e_0$ = 0.09
V	Dense Sand	>20.00	N > 50 blows / 30 cm

	Ground water table is at a depth of 1.0 m below G.L. Determine the stresses at the centre of each layer as indicated above using Newmarks's chart drawn in Q 1(a).	10
	Further, indicate whether there will be any change in bearing capacity if the applied load is not vertical or a moment acts on the foundation.	5
2.	A raft foundation is to be constructed for a multistoried building with a total column load of 3000 ton. Size of the raft is 25m x 15m. Design the raft foundation. Use the Newmark's chart drawn in Q 1(a) and subsoil profile and properties given in Q 1(b).	18