Ref No. Ex/PG/CE/T/128C/2019

M.E. CIVIL ENGINEERINGFIRST YEARSECOND SEMESTEREXAM 2019

RETAINING STRUCTURES AND UNDERGROUND CONSTRUCTION (SMFE)

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 etc. will be needed to answer the questions of this part
4. Notations used bear their usual meanings

No. of Question	Part –I (40Marks)	Marks
Q.1 a)	Illustrate the reason for moment reduction in anchored sheet pile wall and also explain how it is reduced.	5
b)	A cantilever sheet pile wall is required to be driven at a site. Determine the depth of embedment provided if the relevant data are as follows:- Dredge Line: 10m below GL., Water Table: 2m below GL, Subsoil consists of sand althrough, [down to dredge line,γ= 18.5 kN/m^3 and ϕ =31^0 and below dredge line ,γ= 19.2 kN/m^3 and ϕ =33^0]	10
Q.2	A 6m high vertical retaining wall supports a backfill consisting of silty clay (γ= 18.0 kN/m^3, c= 25 kN/m^2, ϕ =15^0) down to 2m from top and rest is sand (γ= 18.5 kN/m^3, c= 0 kN/m^2, ϕ =30^0) a) Draw active and passive earth pressure diagrams on appropriate faces indicating values at salient points and also compute the total active and passive earth pressures. b)Also calculate the factor of safety against overturning and sliding for active case if the retaining wall has a top width of 0.6m, depth below ground=1.5m, projection towards heel=3m and that towards toe =1m, the slope of wall face, opposite to the retaining side is 1H:5V and the thickness of base slab is 1m.	8+7=15
Q.3	Illustrate, in brief, estimation of resistance to sliding and overturning and also the concept of cell shear for a cellular cofferdam with neat sketches.	10

MASTER OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION, 2019
(1ST YEAR 2ND SEMESTER)

(1st / 2nd Semester)

SUBJECT: RETAINING STRUCTURES AND UNDERGROUND CONSTRUCTION(SMFE)

(Name in full)

Full Marks 100

Time: Three hours

No. of Questions	PART II (MARKS 60)	Marks
	Answer all questions	
Q1	10m deep braced excavation is proposed to be done using 800mm thick R.C.C. diaphragm walls for construction of underground car parking / market at a site in central Kolkata. Size of excavation : 60 m x 20 m ; Depth of excavation : 10 m Horizontal struts are proposed to be placed at a depth of 2.0m, 5.5m and 9.0m below ground level. Horizontal distance between the struts will be 4.0m c/c. Subsoil data at the proposed site are given below: Depth 0 – 3.0m : Brownish grey silty clay / clayey silt $\gamma = 18.0$ kN/m^3 , $C_u = 32$ kN/m^2, $m_v = 0.0005$ m^2/kN Depth 3.0 – 15.0m : Dark grey silty clay / clayey silt with decomposed wood $\gamma = 17.0$ kN/m^3 , $C_u = 24$ kN/m^2, $m_v = 0.00065$ m^2/kN Depth 15.0 – 20.0m : Stiff / very stiff bluish / mottled brown silty clay / clayey silt with rusty spots $\gamma = 19.0$ kN/m^3 , $C_u = 70$ kN/m^2, $m_v = 0.00035$ m^2/kN Depth > 20.0m till 35.0m : Dense / very dense sand $\gamma = 20$ kN/m^3, $\varphi = 36^0$ Ground water table at a depth of 1.0m below G.L.\ (i) Check the stability of braced excavation and also indicate depth of braced wall (ii) Draw the earth diagram may develop on the soil side of the wall (iii) Determine moments and forces on the walls, waler beams and struts	10+5+ 12 = 27
Q2	(a) What is **volume of lost ground** in connection with tunneling through clay deposit? How is it related to the stability of a tunnel? Using the above relationship check the stability of a typical 5.5m diameter tunnel with depth of the axis 15.0m below ground surface. Subsoil at the site is same as that given in Q1. (b) Give the expression for settlement trough of the ground surface during tunneling through a soft clay deposit. Using this relationship draw the settlement trough of the ground surface above the tunnel mentioned in Q2(a). Take maximum settlement at the ground surface = 125 mm.	(4+3+8) +(3+5) = 23
Q3	A 0.4m thick and 4.0m high long concrete wall with 2.5m wide and 0.5m thick base is proposed to be constructed over a tunnel as mentioned above. Discuss step by step how the moments at the section above the centre of the tunnel can be calculated.	10