Ref. No. Ex/PG/CE/T/113C/6/2017

MASTER OF CIVIL ENGINEERING EXAMINATION 2017
(1st Semester)

SLOPE STABILITY AND EARTHEN DAM

Time: Three Hours

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

Use a separate Answer-Script for each part

Question No	Part II (60 Marks)	Marks
	*Answer **ALL** questions from this Part.* *Assume reasonable values of data, if not supplied*	
1	The following data pertains to an undisturbed sample collected from an earth dam section. Dry density (γ_d) = 1.65gm/cc. Moisture content (w)=22% Specific Gravity (G) = 2.67 Porosity (n_0) = 40.1% One dimensional consolidation test results are as follows: Stress (Kg/cm^2) Volume strain (%) 0.700 1.00 1.300 2.00 2.300 4.20 Determine pore pressures at the end of construction assuming no dissipation for first stage of loading only. Use Hilf's method. Plot the effective stress, computed pore pressures and total stress against compressibility.	20
2	An earth dam has the following details : Top width = 7 m = Core top width U/s. Slope = 2.5 H : IV D/S Slope = 2H : IV Height = 53 m, Freeboard = 2 m U/s Slope of Core = 0.5 H : IV = D/s Slope of Core. A horizontal impervious blanket of 3.0 m constant thickness is to be provided. The permeability of the blanket material and that of foundation material are 1.5×10^{-5} cm/sec and 2.5×10^{-3} cm/sec respectively. Design a suitable length of blanket and also find the reduction in discharge	20

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Full Marks 1(
(Part I: 40 Mar
Part II: 60 Mark

Use a separate Answer-Script for each part

Question No.	Part II (60 Marks)	Mark
3	The following data relate to an earthen dam. Top width = 6 m U/S. Slope = 1.5 H : IV =D/S Slope Height = 22 m, Freeboard = 2 m Find the points on the top flow line analytically, using L. Casagrande's method and considering no filter at the base. Then draw the top flow line and compute also the seepage discharge if the permeability of the dam material is $5x10^{-4}$ cm/sec. OR Design an impervious blanket with variable thickness for the data given in Q.2, assuming relevant parameters	20

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

Use a separate Answer-Script for each part

Question No.		Part I (40 Marks)	Marks
		Answer any TWO questions from this Part. *Assume reasonable values for the parameters, if not supplied.*	
1	(a)	What is called slope failure? Discuss about the factors affecting stability of a slope.	1+9=10
	(b)	Define 'Long Term' and 'Short Term' stability checking of a slope.	2+2=4
	(c)	What is residual shear strength of a soil sample? How it can be obtained? Which type of soil samples are normally considered for obtaining the residual strength?	1+2+1=4
	(d)	Define pore water pressure and explain its importance.	2
2	(a)	How an earthen slope may behave in gradual drawdown and sudden drawdown cases?	2
	(b)	Distinguish between total stress and effective stress methods of slope stability analyses.	4
	(c)	Indicate the shear strength parameters required for each type of analysis and how the same can be obtained?	4
	(d)	Derive factor of safety of a reinforced slope extending the Bishop's method for slope stability analysis considering all forces on an elementary slice.	10
3	(a)	Derive the stability number for seepage condition parallel to ground up to a depth of H.	6
	(b)	Derive the stability number of an infinite slope in clay.	8
	(c)	Explain the steps of slope stability analysis through Bishop & Morgenstern Method (1960).	6
4	(a)	Make a list of critical cases considered as per IS 7894, for stability analysis of any slope.	5
	(b)	It is required to make a 5.0m deep cut in a c-ϕ soil. The slope is restricted to be 30^O and the soil has C_u = 2.4 t/m^2, $\phi = 7^O$ and γ = 1.8t/m^2. Find the factor of safety and estimate the critical height for the slope in this soil, using the following table for stability number.	9+6=15

β^O \ ϕ^O	0	5	10	15	20	25
90	0.261	0.239	0.218	0.199	0.182	0.166
75	0.219	0.195	0.193	0.152	0.134	0.117
60	0.191	0.162	0.138	0.116	0.097	0.079
45	0.170	0.136	0.108	0.083	0.062	0.044
30	0.156	0.110	0.075	0.046	0.025	0.009
15	0.145	0.068	0.023	-	-	-