Ref. No. Ex/CE/5/T/502/2024

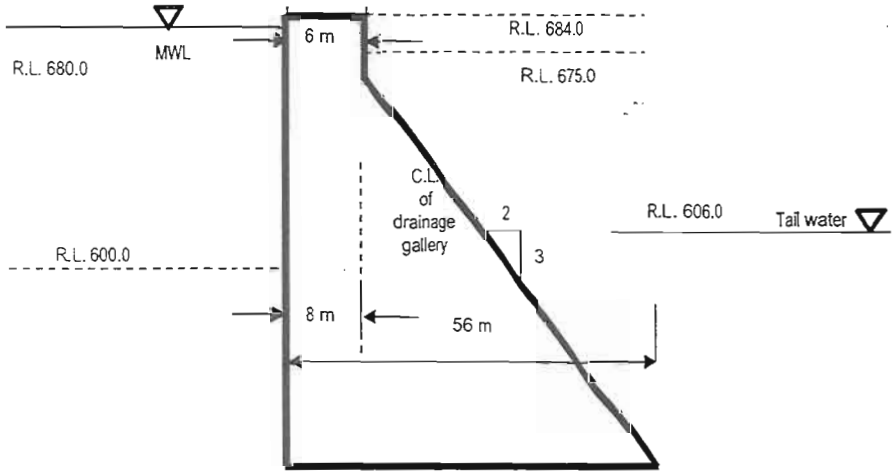
BACHELOR OF ENGINEEERING (CIVIL ENGINEERING) EXAMINATION 2023

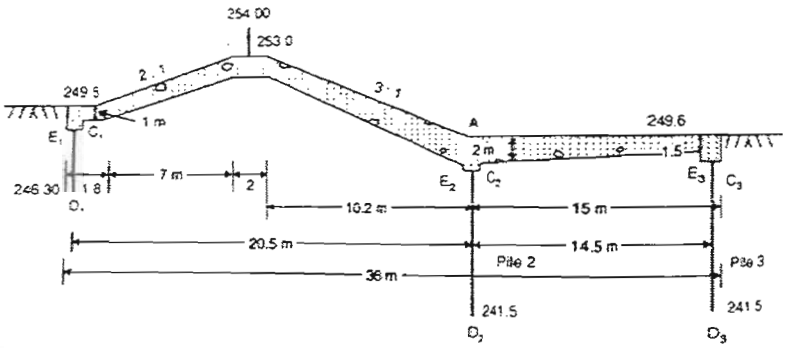
[Fifth Year (Evening); First Semester]

HYDRAULIC STRUCTURES

Total Time: Three Hours

Full Marks 100
(50 marks for each part)

No. of questions	Part A (50 Marks)	Marks
	Attempt all the Questions as Compulsory *Assume suitable values for the parameters if not supplied.*	
1	Draw a typical Area-Elevation curve and explain how such a curve can be drawn from contour maps and cross-sections of a proposed dam site.	3+7=10
2	What is a dam? What are the various types of dams according to hydraulic design? Explain the storage zones of a reservoir with a detailed figure.	2+3+5=10
3	What is the dependability factor in calculation of Design Catchment yield? What are possible factors to decide on the value of dependability factor?	3+7=10
4	Figure below shows a typical cross-section of a gravity dam.  Calculate the max. vertical stresses at the heel and the toe of the dam, major principal stress at the toe, and intensity of shear stress on a horizontal plane near the toe. $\gamma_{conc} = 28\ kN/m^3$.	10+6+4=20

No. of questions	Part B (50 Marks)	Marks
	Attempt all the Questions as Compulsory *Assume suitable values for the parameters if not supplied.*	
1	Derive the governing equation of total flow through an Earthen Dam, using the seepage analysis.	**10**
2	Derive the expression of the unit Tractive Force using the Tractive force theory for canals.	**10**
3	Explain a typical layout of a Diversion Headworks. **OR** Elaborate the Lane's Theory of Seepage Force.	**5**
4	Design the sloping Glacis Weir for the following site condition.  **Calculate the thickness of the glacis weir and depth of the sheet piles only**. Some of the typical values are given in the figure. Show detailed calculations. Maximum discharge capacity over the weir crest = 10 m^3/s per meter length of the glacis H.F.L. before the construction of the weir = 255.0 m R.L. of River bed = 249.5 m Pond level = 254.0 m Height of crest shutters = 1.0 m Anticipated downstream water level when the weir is discharging = 251.5 m Bed retrogression = 0.5 m Lacey's silt factor = 0.9 Permissible exit gradient = 1/7 Permissible afflux = 1.0 m	**25**