U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

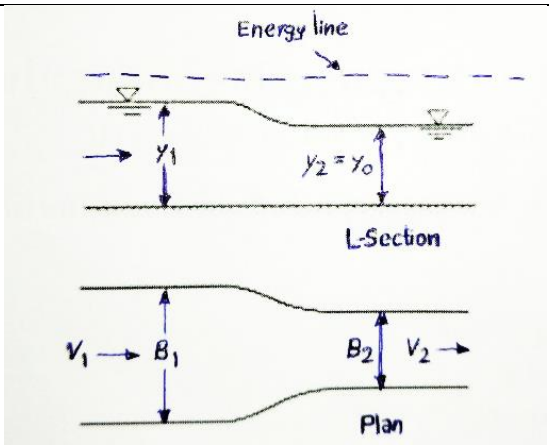
December 2023 Supplementary Examinations

Programme: B.E. **Semester: IV**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 22CV4PCHYE **Max Marks: 100**
Course: Hydraulic Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Explain the formulas used for calculating uniform flow velocity. Also, explain the following terms in an open channel flow i) Froude's Number ii) Hydraulically efficient channel section	*CO1*	*PO1*	**06**
	b)		A trapezoidal channel has a bed width of 2.0 m and side slopes of 1.5 horizontal to 1 vertical. The channel has a longitudinal slope of 1/4000. If the Manning's coefficient of the channel boundary is 0.018, calculate the mean velocity and discharge in the channel for a depth of 1.4 m	*CO1*	*PO1*	**06**
	c)		For a flow in a rectangular channel of width 5 m and depth of flow of 2.3 m the Darcy-Weisbach friction factor ***f*** is estimated to be 0.02. Estimate the values of Chezy's **C** and Manning's **n.**	*CO1*	*PO1*	**08**
			UNIT - II			
2	a)		Explain the characteristics of the critical flow with usual notations.	*CO1*	*PO1*	**05**
	b)		Derive the conditions for critical flow in rectangular channel sections.	*CO1*	*PO1*	**07**
	c)		Discuss briefly the momentum and energy correction factors.	*CO1*	*PO1*	**08**
			UNIT - III			
3	a)		With neat sketch explain categories of the channel bed slope and discuss the classification of gradually varied flow profiles with characteristic conditions using the parameters like normal depth of flow and critical depth.	*CO1*	*PO1*	**10**
	b)		A rectangular channel 2.5 m wide carries a flow of 2.75 m^3/s at a depth of 0.9 m. A contraction of channel width is proposed at a certain section (Fig. 1). Find the smallest allowable contracted width that will not affect the upstream flow conditions.	*CO1*	*PO2*	**10**

			 Fig.1.			
			OR			
	4	a)	With neat sketch explain the arrival of sequent depth ratio for the rapidly varied flow. State the assumptions made in the analysis.	*CO1*	*PO1*	**10**
		b)	Given the energy loss and Froude number after the jump as 9.00 m and 0.12, respectively. Estimate the discharge intensity and initial depth of the hydraulic jump in a rectangular channel.	*CO1*	*PO2*	**10**
			UNIT IV			
	5	a)	Define boundary condition and Explain the Navier-Stokes Equation in Cartesian coordinate system for two dimensional laminar flow.	*CO2*	*PO1*	**10**
		b)	Discuss step by step procedure involved in the development of the CFD model using basic governing differential equations to address water related problems.	*CO2*	*PO1*	**10**
			UNIT - V			
	6	a)	Explain the purpose of dimensional analysis in Hydraulic Engineering.	*CO3*	*PO1*	**04**
		b)	Discuss about the dimensional homogeneity using Manning's formula for uniform velocity **V** in an open channel. Determine the dimensions of **n** in this equation.	*CO3*	*PO1*	**06**
		c)	The drag force $\mathbf{F_D}$ on a sphere in laminar flow is known to depend on its diameter **D**, velocity of flow **V**, density of fluid **ρ** and coefficient of viscosity **μ**. Obtain an expression for $\mathbf{F_D}$ using Raleigh's method.	*CO3*	*PO1*	**10**

****