U.S.N.										

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

Autonomous Institute Affiliated to VTU

August 2024 Semester End Main 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.

			CO	PO	Marks
		UNIT – I			
1	a)	Illustrate the difference between velocity profile of flow in a wide-shallow and a narrow-deep rectangular channel.	*CO* 1	*PO1*	**6**
	b)	Prove that for most economical rectangular channel section, the bottom width is twice the depth of flow.	*CO* 1	*PO1*	**6**
	c)	An irrigation channel of trapezoidal section, having side slopes 3 horizontal to 2 vertical, is to carry a flow of 10 cumecs on a longitudinal slope of 1 in 5000. The channel is to be lined for which the Manning's friction coefficient n = 0.012. Determine the dimensions of the most economic section of the channel.	*CO1*	*PO2*	**8**
		UNIT – II			
2	a)	Explain momentum and energy correction factor in fluid flow with the help of an appropriate expressions.	*CO* 1	*PO1*	**6**
	b)	For a constant specific energy of 1.8 N.m/N, calculate the maximum discharge that may occur in a rectangular channel 5.0 m wide.	*CO* 1	*PO1*	**6**
	c)	Calculate the possible depths of flow at which a discharge of 26.67 cumec may be carried in a rectangular channel 3.5 m wide with a specific energy equal to 2.74 m.	*CO1*	*PO2*	**8**
		UNIT - III			
3	a)	A rectangular channel 7.5 m wide has a uniform depth of flow of 2.0 m and has a bed slope of 1 in 3000. If due to weir constructed at the downstream end of the channel, water surface at a section is raised by 0.75 m, determine the water surface slope with respect to horizontal at this section. Assume Manning's n = 0.02.	*CO* 1	*PO1*	**12**
	b)	A horizontal rectangular channel 4 m wide carries a discharge of 16 m^3/s. Determine whether a jump may occur at an initial depth of 0.5 m or not. If a jump occurs, determine the sequent depth to this initial depth. Also determine the energy loss in the jump.	*CO* 1	*PO1*	**08**

			OR			
	4	a)	Derive an expression for gradually varied flow in a wide rectangular channel using Manning's equation.	***CO*** 1	***PO1***	**12**
		b)	In a rectangular channel a hydraulic jump occurs at a location where the Froude's number $Fr_1 = 2.5$. Determine the critical depth and head loss in terms of the initial depth Y_1.	***CO*** 1	***PO1***	**08**
			UNIT – IV			
	5	a)	Explain the major differences between experimental, numerical and analytical models.	***CO*** 2	***PO2***	**10**
		b)	List the advantages and drawbacks of CFD modelling. Also, elaborate on general steps in CFD model development.	***CO*** 2	***PO1***	**10**
			UNIT – V			
	6	a)	Explain the law of dimensional homogeneity using Bernoulli's energy equation as an example.	***CO*** 3	***PO2***	**6**
		b)	Briefly comment on conditions for similarity between models and prototype.	***CO*** 3	***PO2***	**6**
		c)	Find an expression for drag force F on a smooth sphere of diameter D, moving with a uniform velocity V in a fluid of mass density ρ and dynamic viscosity μ.	***CO*** 3	***PO2***	**8**

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