U.S.N.										

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

Autonomous Institute Affiliated to VTU

September / October 2024 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)	Elaborate any four factors affecting Manning's roughness coefficient.	CO1	PO1	**4**
	b)	Prove that for most economical rectangular channels, the hydraulic radius when set as half of flow depth provides the least wetted perimeter.	CO1	PO1	**6**
	c)	A channel carries a discharge of 5 cumecs with a flow depth 1 m. The side slopes are 1 horizontal to 1 vertical and bed slope 1 in 3520. Compute the bed width and the velocity of flow in the channel. The values of Chezy's coefficient for this channel for different values of hydraulic radius R are as tabulated below.	CO1	PO2	**10**

Hydraulic radius R	0.7	0.8	0.9	1.0	1.1	1.2
Chezy's coefficient	34	35	37	38	39	40

		UNIT - II			
2	a)	List the characteristics of critical flow in an open channel.	CO1	PO1	**4**
	b)	Derive the condition for maximum discharge through an open channel for a given specific energy.	CO1	PO1	**6**
	c)	A rectangular channel which is laid on a bottom slope of 0.0064 is to carry 20 m^3/s of water. Determine the width of the channel when the flow is in the critical condition. Take Manning's n = 0.015.	CO1	PO1	**10**
		UNIT - III			
3	a)	Derive the expression for gradually varied flow in a wide rectangular channel using Manning's equation.	CO1	PO1	**10**
	b)	A rectangular channel having bottom width 8 m carries a discharge of 80 m^3/s. Determine the depth conjugate to an initial depth of 0.75 m before the jump. Also determine the loss of energy in the jump.	CO1	PO2	**10**
		OR			

	4	a)	A rectangular channel has a bed width 4 m, bottom slope = 0.0004 and Manning's roughness coefficient 0.02. Normal depth of flow in this channel is 2.0 m. If the channel empties into a pool at the downstream end and the pool elevation is 0.60 m higher than the channel bed elevation at the downstream end, identify the surface profile in the region where the channel meets the pool.	*CO1*	*PO2*	**10**
		b)	Show that the head loss in a hydraulic jump formed in a horizontal rectangular channel may be expressed as $$\Delta E = \frac{(V_1 - V_2)^3}{2g(V_1 + V_2)}$$	*CO1*	*PO1*	**10**
			UNIT - IV			
	5	a)	Explain computational fluid dynamics with its advantages.	*CO2*	*PO1*	**4**
		b)	Discuss Dirichlet and Neumann boundary conditions in the context of fluid mechanics.	*CO2*	*PO1*	**6**
		c)	Discuss Navier-Stokes equation and the computational steps required to arrive at its approximate solutions.	*CO2*	*PO1*	**10**
			UNIT - V			
	6	a)	Explain the law of dimensional homogeneity using Bernoulli's energy equation as an example.	*CO3*	*PO1*	**5**
		b)	Derrive 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** using Rayleigh's method.	*CO3*	*PO1*	**7**
		c)	The pressure drop **ΔP** in flow through pipes per unit length is found to depend on the average velocity **u**, diameter **D**, density of the fluid **ρ**, and viscosity **μ**. Using the MLT set of dimensions derive the dimensionless parameters correlating this phenomenon.	*CO3*	*PO1*	**8**

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