Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN											Course Code	2	1	C	V	4	2

Fourth Semester B.E. Degree Examinations, September/October 2023

FLUID MECHANICS AND HYDRAULICS

Duration: 3 hrs **Max. Marks: 100**

Note: ***1. Answer any* FIVE *full questions, choosing* ONE *full question from each module.***
2. Missing data, if any, may be suitably assumed

Q. No		*Question*	*Marks*	*(RBTL:CO: PI)*
		MODULE – 1		
1.	**a.**	Define, i) Mass density ii) Specific weight iii) Specific gravity iv) Dynamic Viscosity v) Kinematic Viscosity vi) Capillarity	**06**	(1 :1: 1.3.1)
	b.	Explain classification of fluids along with graphical representation.	**06**	(2 :1: 1.3.1)
	c.	Explain Pascal's law with statement and proof.	**08**	(3 :1: 1.4.1)
		OR		
2.	**a.**	With neat sketches explain types of simple manometers.	**08**	(2 :1: 1.3.1)
	b.	Derive an expression for total pressure on vertical surface.	**06**	(3 :1: 1.4.1)
	c.	A simple U-tube manometer is used to measure the pressure of a fluid of specific gravity 0.9 flowing in a pipe. The left limb is connected to pipe and right limb is open to atmosphere. The centre of pipe is 12 cm below the level of heavy liquid in right limb. Find the pressure of the fluid in the pipe, if the difference of heavy liquid level in two limbs is 20 cm. Take Hg as heavy liquid.	**06**	(3 :1: 1.4.1)
		MODULE – 2		
3.	**a.**	Explain different types of fluid flow.	**08**	(2 :2: 1.3.1)
	b.	Derive an expression for continuity equation in 3D Cartesian coordinates for fluid flow.	**12**	(3 :2: 1.4.1)
		OR		
4.	**a.**	Derive Bernoulli's equation for total energy in fluid flow.	**08**	(2 :2: 1.3.1)
	b.	Derive an expression for discharge in Venturimeter.	**06**	(3 :2: 1.4.1)
	c.	An Orifice meter with orifice diameter 15 cm is inserted in a pipe of diameter 30 cm. The pressure difference measured by an Hg-oil differential manometer on the two sides of the orifice meter gives a reading of 50 cm of Hg. Find the rate of flow of oil of specific gravity 0.9. Co-efficient of discharge = 0.64.	**06**	(3 :2: 1.4.1)
		MODULE – 3		
5.	**a.**	Define Orifices and classify different types of Orifices.	**06**	(1 :3: 1.3.1)
	b.	Derive an expression for discharge over Triangular notch.	**08**	(3 :3: 1.4.1)
	c.	Water flows over a rectangular notch 1m wide at a depth of 150 mm and afterwards passes through a triangular right-angled notch. Taking Cd for rectangular and triangular notch as 0.62 and 0.59 respectively. Find the depth over the triangular notch.	**06**	(3 :3: 1.4.1)

Note: (**RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)**

OR

6.	**a.**	Enlist different types of losses in pipes.	**03**	(1 :3: 1.3.1)
	b.	Derive Darcy's Weisbach equation for head loss due to friction.	**10**	(3 :3: 1.4.1)
	c.	Find the head loss due to friction in a pipe of diameter 300 mm and length 500m through which water is flowing at a velocity of 3m/sec. Take kinematic viscosity =0.01stokes. Use Darcy's Weisbach and Reynold's Number equation.	**07**	(3 :3: 1.4.1)

MODULE – 4

7.	**a.**	Explain following types of flow in open channels i) Uniform and Non-Uniform ii) Sub-critical and Super critical flow iii) Laminar and Turbulent flow	**06**	(2 :4: 1.3.1)
	b.	Show that for the most economical Trapezoidal section i) Half the top width is equal to the one of the sloping sides ii) Hydraulic mean depth is equal to half the depth of flow.	**07**	(3 :4: 1.4.1)
	c.	A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the side slope of the bed is 1in 2000.The area of the cross section is 40m2. Find the dimensions of the section if it is most economical. Also find the discharge of this most economical section if C= 55.	**07**	(3 :4: 1.4.1)

OR

8.	**a.**	What is Specific energy curve? Draw the specific energy curve, and hence derive expressions for critical depth and critical velocity	**06**	(2 :4: 1.3.1)
	b.	A 3m wide rectangular channel carries 2.4 m3/s discharge at a depth of 0.7m. Determine: i) Specific Energy at 0.7 m depth ii) Critical depth iii) Alternate depth to 0.7 m.	**07**	(3 :4: 1.4.1)
	c.	Define Gradually varied flow (GVF). Derive an expression for GVF in an open channel flow.	**07**	(3 :4: 1.4.1)

MODULE – 5

9.	**a.**	**W**ith neat sketch explain the concepts of velocity triangles.	**08**	(2 :5: 1.3.1)
	b.	How do you classify the turbines? With a sketch explain the parts of a Pelton turbine.	**06**	(3 :5: 1.4.1)
	c.	A jet of water of diameter 75 mm moving with velocity of 30 m/s, strikes a curved fixed plate tangentially at one end at an angle of 30 to the horizontal. The jet leaves the plate at an angle of 200 to the horizontal. Find the force exerted by the jet on the plate in the horizontal and vertical direction.	**06**	(3 :5: 1.4.1)

OR

10.	**a.**	Explain with neat sketches working principle of Multistage Centrifugal Pumps for i) High Heads and ii) High Discharge	**12**	(2 :5: 1.3.1)
	b.	With neat sketch explain different components of Centrifugal pump.	**08**	(3 :5: 1.4.1)

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