

Basavarajeswari Group of Institutions  
**BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT**  
 (Autonomous Institute under Visvesvaraya Technological University, Belagavi)

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Course Code 

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Fourth Semester B.E. Degree Examinations, September 2024

**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.

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO:PI)</u>
<b>MODULE – 1</b>			
1.	a. Define fluid and briefly explain different forms of fluid.	06	(1 : 1 : 1.3.1)
	b. List and explain different properties of fluid.	06	(2 : 1 : 1.3.1)
	c. Explain Pascal’s law with statement and proof.	08	(3 : 1 : 1.4.1)
<b>OR</b>			
2.	a. With neat sketches explain types of simple manometers.	08	(1 : 1 : 1.4.1)
	b. Explain hydrostatic law with statement and proof.	06	(3 : 1 : 1.2.1)
	c. Calculate the pressure due to a column of 0.3 m of (i) Water (ii) An oil of specific gravity 0.8 (iii) Hg of specific gravity 13.6 Given density of water 1000 kg/m <sup>3</sup> .	06	(2 : 1 : 1.4.1)
<b>MODULE – 2</b>			
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)
<b>OR</b>			
4.	a. Derive Bernoulli’s equation for total energy in fluid flow.	12	(2 : 2 : 1.3.1)
	b. An oil of specific gravity 0.8 is flowing through Venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil-Hg differential manometer shows reading of 25 cm. Calculate the discharge of oil through the horizontal Venturimeter. Take C <sub>d</sub> equal to 0.98.	08	(3 : 2 : 1.4.1)
<b>MODULE – 3</b>			
5.	a. Define Orifices and classify different types of Orifices.	06	(1 : 3 : 1.3.1)
	b. Derive an expression for discharge over Rectangular notch.	06	(3 : 3 : 1.4.1)
	c. Water flows over a rectangular notch 0.6 m wide at a depth of 170 mm and afterwards passes through a triangular right angled notch. Taking C <sub>d</sub> for rectangular and triangular notch as 0.62 and 0.59 respectively. Find the depth over the triangular notch.	08	(3 : 3 : 1.4.1)
<b>OR</b>			
6.	a. Write a note on losses in pipe.	05	(1 : 3 : 1.3.1)
	b. Derive Darcy’s Weisbach equation for head loss due to friction.	08	(3 : 3 : 1.4.1)

- c. Find the head loss due to friction in a pipe of diameter 350 mm and length 600 m through which water is flowing at a velocity of 2.5 m/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. Show that for the most economical rectangle section (i) Depth of flow is equal to the half the width (ii) Hydraulic mean depth is equal to half the depth of flow. **12** (3 :4 : 1.4.1)
- b. A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the side slope of the bed is 1in 1800.The area of the cross section is 38 m<sup>2</sup>. Find the dimensions of the section if it is most economical. Also find the discharge of this most economical section if C = 55. **08** (2 :4 : 1.4.1)

**OR**

8. a. Derive expressions for critical depth and critical velocity. **08** (2 :4 : 1.4.1)
- b. A 2.5 m wide rectangular channel carries 2.8 m<sup>3</sup>/s discharge at a depth of 0.6 m. Determine (i) Specific Energy at 0.6 m depth (ii) Critical depth (iii) Critical velocity. **12** (3 :4 : 1.4.1)

**MODULE – 5**

9. a. Enlist differences between Pelton wheel turbine and Francis turbine. **10** (2 :5 : 1.4.1)
- b. 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<sup>0</sup> to the horizontal. The jet leaves the plate at an angle of 20<sup>0</sup> to the horizontal. Find the force exerted by the jet on the plate in the horizontal and vertical direction. **10** (3 :5 : 1.4.1)

**OR**

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

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