

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-III EXAMINATION – WINTER 2025****Subject Code:3131307****Date:22-12-2025****Subject Name: Basics of Environmental Hydraulics****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
Q.1	(a) Define the following terms: (a) Specific Gravity (ii) Capillarity (iii) ideal fluid	03
	(b) Explain the effect of temperature on viscosity of liquid and gas.	04
	(c) Explain the concept of surface tension with figure. Derive the relationship between surface tension and pressure inside a droplet of liquid in excess of outside pressure.	07
Q.2	(a) State Bernoulli's theorem and write down the assumptions for it.	03
	(b) With a neat sketch explain piezometer.	04
	(c) State and derive Hydrostatic Law.	07
	OR	
	(c) Explain the different types of fluids with figure.	07
Q.3	(a) Define the term: (i) Gauge pressure (ii) Centre of pressure (iii) Total Pressure	03
	(b) Define the terms: (i) steady flow (ii) laminar flow (iii) Uniform Flow (iv) one dimensional flow	04
	(c) Derive an expression for the force exerted on a submerged vertical plane surface by the static liquid and locate the position of centre of pressure.	07
	OR	
Q.3	(a) What do you mean by continuity equation? explain in brief.	03
	(b) Explain the different equations of motion.	04
	(c) Derive Euler's equation of motion.	07
Q.4	(a) Explain the losses of energy in pipe.	03
	(b) Explain the Chezy's Formula for loss of head due to friction in pipe.	04
	(c) Derive the equation of loss of head due to sudden Enlargement.	07
	OR	
Q.4	(a) Enlist the minor energy losses.	03
	(b) Explain flow through parallel pipes.	04
	(c) Derive an equation of discharge for Orifice meter.	07
Q.5	(a) Give the classification of orifices.	03
	(b) Give the classification of notches and weirs	04
	(c) Derive an equation of discharge for Venturimeter.	07
	OR	
Q.5	(a) Explain the term : Coefficient of velocity, Coefficient of contraction, Coefficient of discharge.	03
	(b) Derive an equation of discharge over a rectangular notch or weir	04
	(c) Derive an equation of discharge over a triangular notch or weir.	07

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-III (NEW) EXAMINATION – WINTER 2024****Subject Code: 3131307****Date:10-12-2024****Subject Name: Basics of Environmental Hydraulics****Time: 10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
Q.1	(a) Define & Explain (i) Specific gravity (ii) Capillarity (iii) Mass density	03
	(b) Distinguish dynamic viscosity and kinematic viscosity. State their unit.	04
	(c) Derive an expression for Bernoulli's equation and mention the Assumptions.	07
Q.2	(a) Define the term: Pitot tube.	03
	(b) Explain the U-tube Differential manometer.	04
	(c) State and prove the Pascal's law.	07
	OR	
	(c) Derive an expression for the discharge through an Orifice meter.	07
Q.3	(a) Define HGL and TEL	03
	(b) An oil of kinematic viscosity 0.6 stoke is flowing through a pipe of 31 cm diameter at a rate of 321 liter per second. Find the head loss due to friction for the pipe length of 60 m.	04
	(c) List the minor losses and Derive formula for calculating loss of head due to sudden Contraction.	07
	OR	
Q.3	(a) Define Static Pressure and Dynamic Pressure.	03
	(b) Determine the diameter of a pipe of length 2550 m when the rate of flow of water through the pipe is 230 lit/s and the head loss due to friction is 6 m. Take the value of $C = 60$ in Chezy's formula.	04
	(c) Derive a Darcy Weisbach equation for Head Loss due to friction in pipe.	07
Q.4	(a) Define Co-efficient of Discharge and Co-efficient of Velocity.	03
	(b) A submarine fitted with a pitot tube moves horizontally in sea. Its axis is 12.5 m below the surface of the water. The pitot tube fixed in front of the submarine and along its axis is connected to the two limbs of a U-tube containing mercury, the reading of which is found to be 201 mm. find the speed of the submarine. Take the specific gravity of sea water = 1.025 times fresh water.	04
	(c) Derive an expression for time of emptying a tank through an orifice of rectangular tank.	07
	OR	
Q.4	(a) Classification of orifice.	03
	(b) Water flows at the rate of $0.016 \text{ m}^3/\text{s}$ through a 101 mm diameter orifice used in a 201 mm pipe. What is the difference in pressure head between the upstream section and venacontracta section? Take co-efficient of contraction $C_c = 0.6$ and $C_v = 1$.	04
	(c) Derive an expression for time of emptying a tank through an orifice of circular horizontal tank.	07

- Q.5** (a) Define notches and weirs. **03**
(b) Write short note on Pipes in compound pipes. **04**
(c) What do you mean by “Most economical section” of an open channel?
How it is determined? **07**

OR

- Q.5** (a) Define Vena-contracta and co-efficient of contraction. **03**
(b) Distinguish between Notches and Weirs. **04**
(c) Derive an expression for the discharge over a Triangular notch or weir. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III (NEW) EXAMINATION – WINTER 2023****Subject Code:3131307****Date:25-01-2024****Subject Name:Basics of Environmental Hydraulics****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Define the terms. (1) Capillary effect (2) Viscosity (3) specific gravity	03
	(b) Explain surface tension and prove the relationship between surface tension and pressure for liquid droplet.	04
	(c) Derive an expression for Euler's equation of motion.	07
Q.2	(a) State the pascal's law and prove it.	03
	(b) A U-tube manometer contains the mercury as monomeric liquid. One end of manometer is connected to a pipe in which a fluid of specific gravity 0.8. The level of mercury in right limb is 7 cm above the center of pipe. Calculate pressure of fluid in a pipe when the difference of mercury level in two limbs is 17 cm.	04
	(c) Define fluid and give the classification of fluids with figure.	07
	OR	
	(c) Derive an expression for total pressure and center of pressure for vertical plane surface submerged in static liquid.	07
Q.3	(a) State Bernoulli's theorem. Also write down assumptions and applications for it.	03
	(b) A horizontal Venturimeter with inlet diameter 150 mm and throat diameter 75 mm is employed to measure the discharge of water. The differential manometer connected to the inlet gives reading of 150 mm of mercury. Determine the rate of flow if the co-efficient of discharge is 0.98.	04
	(c) Derive an expression for equation of continuity in a 3D flow in Cartesian co-ordinates system.	07
	OR	
Q.3	(a) Write a short note on Pitot tube.	03
	(b) A pipe is having diameters, 30 cm and 15 cm at the cross sections 1 and 2 respectively, through which water is flowing. The velocity of water at section-1 is given as 6 m/s. determine the velocity head at section-1 and 2 and also flow rate.	04
	(c) Derive an expression for rate of flow through Venturimeter.	07
Q.4	(a) Classify the various energy (Major & Minor) losses in pipe.	03
	(b) Differentiate between open channel and pipe flow.	04
	(c) Derive a Darcy Weisbach equation for Head Loss due to friction in pipe and also derive Chezy's formula from that.	07

OR

Q.4	(a) Define EGL and HGL.	03
	(b) Explain the different types of fluid flow.	04
	(c) Derive an expression for most efficient and economical cross section for rectangular cross section	07
Q.5	(a) Explain the term vena contracta.	03
	(b) Give classification of orifices and mouthpieces.	04
	(c) Derive an expression for discharge through a large rectangular Orifice.	07
OR		
Q.5	(a) Define all hydraulic co-efficient.	03
	(b) Differentiate between Notch & Weir.	04
	(c) Derive an expression for discharge through triangular notch/weir.	07

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– III(NEW) EXAMINATION – WINTER 2022****Subject Code:3131307****Date:27-02-2023****Subject Name:Basics of Environmental Hydraulics****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
Q.1	(a) Define & Explain (i) Density (ii) Gauge Pressure (iii) Specific Gravity	03
	(b) Explain the term viscosity and differentiate between Kinematic viscosity and Dynamic viscosity.	04
	(c) Derive an expression for Bernoulli's equation and mention the Assumptions.	07
Q.2	(a) Define the term: Pitot tube.	03
	(b) Explain the different types of fluids.	04
	(c) State and prove the Pascal's law.	07
	OR	
	(c) Derive an expression for the discharge through an Orificemeter.	07
Q.3	(a) Define Total energy line and Hydraulic Gradient Line	03
	(b) A flat plate 30 cm × 50 cm slides on oil ($\mu = 0.8 \text{ Ns/m}^2$) over a large plane surface. What is the force required to drag the plate at 2 m/s if separating oil film is 0.4 mm thick ?	04
	(c) Derive Chezy's formula for calculating loss of head due to friction in pipe.	07
	OR	
Q.3	(a) Define Laminar flow and Turbulent Flow.	03
	(b) Find the diameter of a pipe length 2000 m when the rate of flow of water through the pipe is 200 lit/s head loss due to friction is 4 m. take the value of $C = 50$ in Chezy's formula.	04
	(c) List the minor losses and Derive formula for calculating loss of head due to sudden contraction.	07
Q.4	(a) Define Co-efficient of Discharge and Co-efficient of Velocity.	03
	(b) Find the discharge through a totally drowned orifice 2.0 m wide and 1 m deep, if the difference of water levels on both the sides of the orifice be 3 m. take $C_d = 0.62$.	04
	(c) Derive an expression for time of emptying a tank through an orifice of circular horizontal tank.	07
	OR	
Q.4	(a) Classification of Orifice.	03
	(b) Find the loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. the rate of flow of water through the pipe is 250 lit/s.	04
	(c) Derive an expression for time of emptying a tank through an orifice of rectangular tank.	07
Q.5	(a) Define Vena-contracta and co-efficient of contraction.	03
	(b) Distinguish between Notches and Weirs.	04
	(c) Derive an expression for the discharge over a trapezoidal notch or weir.	07

OR

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| Q.5 | (a) | Classification of flow in channels. | 03 |
| | (b) | Classification of Notches and weirs. | 04 |
| | (c) | Derive an expression for the discharge over a Rectangular notch or weir. | 07 |