

GUJARAT TECHNOLOGICAL UNIVERSITY**3 SEMESTER – OLD PAPER – WINTER 2025 TO SUMMER 2026 – QUESTION BANK****Subject Name & Code: Basics of Environmental Hydraulics – BE03013021**

Chapter 1: Properties of Fluid**Repeated Questions:****1. Viscosity (Theory):**

- **Q.** Explain the term viscosity and differentiate between Kinematic viscosity and Dynamic viscosity. / Derive relation between dynamic and kinematic viscosity. **(WINTER 2025, 4 Marks; SUMMER 2026, 4 Marks)**

Other Important Questions:**1. Types of Fluids and Fluid Concepts (Theory):**

- **Q.** Define fluids and explain different types of fluid with figure. [Diagram required – refer to the original question paper] **(WINTER 2025, 7 Marks)**
- **Q.** Differentiate between ideal and real fluids. **(SUMMER 2026, 4 Marks; SUMMER 2026, 4 Marks OR)**
- **Q.** Explain fluid as continuum and its importance in environmental hydraulics. **(SUMMER 2026, 7 Marks)**

2. Properties of Fluids (Theory):

- **Q.** Define & Explain (i) Capillary Effect (ii) Specific Gravity (iii) Mass density. **(WINTER 2025, 3 Marks)**
- **Q.** Define viscosity and density. **(SUMMER 2026, 3 Marks)**
- **Q.** Explain all properties of fluids in detail with examples. **(SUMMER 2026, 7 Marks; SUMMER 2026, 7 Marks OR)**

3. Numerical Problems:

- **Q.** A fluid has dynamic viscosity 0.9 Ns/m^2 and density 900 kg/m^3 . Find kinematic viscosity. **(SUMMER 2026, 3 Marks; SUMMER 2026, 3 Marks OR)**

Chapter 2: Hydrostatics

Repeated Questions:

None identified.

Other Important Questions:

1. Pascal's Law and Pressure Variation (Theory):

- Q. State and explain the Pascal's law with its applications. (WINTER 2025, 7 Marks)
- Q. Derive pressure-height relationship. (SUMMER 2026, 3 Marks)

2. Hydrostatic Force on Submerged Surfaces (Theory):

- Q. Derive expressions for total force and centre of pressure on a vertical plane surface submerged in static liquid. (WINTER 2025, 7 Marks OR)

3. Pressure Measurement – Piezometer and Manometers (Theory):

- Q. Draw simple sketch and explain working of piezometer. [Diagram required – refer to the original question paper] (WINTER 2025, 3 Marks)
- Q. Give classification of manometer. (WINTER 2025, 3 Marks OR)
- Q. Explain measurement of pressure using manometers. (SUMMER 2026, 7 Marks OR)

4. Numerical Problems:

- Q. A U-tube manometer contains the mercury as manometric 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 centre of pipe. Calculate pressure of fluid in a pipe when the difference of mercury level in two limbs is 17 cm. [Diagram required – refer to the original question paper] (WINTER 2025, 4 Marks)

Chapter 3: Basics of Fluid Kinetics & Dynamics

Repeated Questions:

1. Bernoulli's Theorem (Theory):

- **Q.** State Bernoulli's theorem and write down the assumptions for it. / Explain Bernoulli's equation with assumptions and explain its applications. **(WINTER 2025, 3 Marks; SUMMER 2026, 4 Marks)**

2. Venturimeter and Pitot Tube (Theory):

- **Q.** Derive an expression for rate of flow through Venturimeter. / Explain working of venturi meter and pitot tube with diagram. [Diagram required – refer to the original question paper] **(WINTER 2025, 7 Marks OR; SUMMER 2026, 7 Marks)**

Other Important Questions:

1. Types of Flow (Theory):

- **Q.** Distinguish between: (1) Rotational and Irrotational flow (2) Uniform and Nonuniform flow. **(WINTER 2025, 4 Marks)**
- **Q.** Describe types of flow. **(SUMMER 2026, 4 Marks OR)**

2. Continuity Equation (Theory):

- **Q.** Derive an expression for equation of continuity in a 3D flow in Cartesian co-ordinates system. **(WINTER 2025, 7 Marks OR)**
- **Q.** Define continuity equation. **(SUMMER 2026, 3 Marks OR)**

3. Euler's Equation of Motion (Theory):

- **Q.** Derive an expression for Euler's equation of motion. **(WINTER 2025, 7 Marks)**

4. Numerical Problems:

- **Q.** 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. **(WINTER 2025, 4 Marks OR)**

Chapter 4: Flow Through Pipes

Repeated Questions:

1. EGL and HGL (Theory):

- **Q.** Define EGL and HGL. / Define hydraulic gradient line (HGL). (**WINTER 2025, 3 Marks OR; SUMMER 2026, 3 Marks OR**)

Other Important Questions:

1. Energy Losses and Flow Through Pipes (Theory):

- **Q.** Classify the various energy (Major & Minor) losses in pipe. (**WINTER 2025, 3 Marks**)
- **Q.** Explain flow through pipes with losses include HGL & TEL diagram. [Diagram required – refer to the original question paper] (**SUMMER 2026, 4 Marks**)

2. Darcy–Weisbach and Chezy's Formula (Theory):

- **Q.** Derive a Darcy Weisbach equation for Head Loss due to friction in pipe and also derive Chezy's formula from that. (**WINTER 2025, 7 Marks**)

3. Numerical Problems:

- **Q.** Calculate the discharge through a pipe of diameter 250 mm when the difference of pressure head between the two ends of pipe 500 m apart is 3.5 m of water. Take value of friction factor is 0.04. (**WINTER 2025, 3 Marks OR**)
- **Q.** Water flows through a pipe of length 800 m and diameter 0.25 m at a discharge of $0.15 \text{ m}^3/\text{s}$. The friction factor $f = 0.02$. Find the head loss due to friction. (**SUMMER 2026, 4 Marks OR**)

Chapter 5: Flow through orifice and mouthpiece

Repeated Questions:

1. Orifice, Mouthpiece and Vena Contracta (Theory):

- **Q.** Define orifice and mouthpiece and explain the term vena contracta. / Define vena contracta. (WINTER 2025, 3 Marks; SUMMER 2026, 3 Marks)

Other Important Questions:

1. Classification and Types of Orifices and Mouthpieces (Theory):

- **Q.** Give classification of orifices and mouthpieces. (WINTER 2025, 3 Marks OR)
- **Q.** Explain different types of mouthpieces and discharge equations. (SUMMER 2026, 7 Marks OR)

2. Hydraulic Coefficients (Theory):

- **Q.** Write a short note on the hydraulic co-efficients. (WINTER 2025, 4 Marks)

3. Time of Emptying a Tank (Theory):

- **Q.** Derive time of emptying tank through orifice. (SUMMER 2026, 7 Marks)

4. Numerical Problems:

- **Q.** An orifice of diameter 0.15 m discharges water under a head of 4 m. $C_d = 0.62$. Find discharge. (SUMMER 2026, 4 Marks OR)

Chapter 6: Flow Through Notches and weirs

Repeated Questions:

None identified.

Other Important Questions:

1. Notch and Weir (Theory):

- Q. Differentiate between Notch & Weir. (WINTER 2025, 4 Marks)
- Q. Define notch and weir. (SUMMER 2026, 3 Marks)

2. Discharge Through Notches (Theory):

- Q. Derive an expression for discharge through triangular notch. (WINTER 2025, 7 Marks)

3. Numerical Problems:

- Q. Water flows over a rectangular notch of width 1 m with head 0.5 m. $C_d = 0.62$. Find discharge. (SUMMER 2026, 4 Marks)

Chapter 7: Flow through open channel

Repeated Questions:

1. Most Efficient Channel Section (Theory):

- Q. Derive an expression for most efficient and economical cross section for rectangular cross section. / Explain flow through open channel and most efficient section. / What is most efficient section? (WINTER 2025, 7 Marks OR; SUMMER 2026, 7 Marks; SUMMER 2026, 3 Marks OR)

Other Important Questions:

1. Open Channel Flow (Theory):

- Q. Differentiate between open channel flow and pipe flow. (WINTER 2025, 4 Marks OR)

Uncategorised Questions

1. Question Not Categorised in Source:

- Q. [Question text missing in source] [Data truncated in source – refer to the original question paper] (SUMMER 2026, [marks missing in source] OR)
