

GUJARAT TECHNOLOGICAL UNIVERSITY

DI -4 SEMESTER – OLD PAPER – S23 TO S25 – QUESTION BANK(English)

Subject Name & Code:

Fluid Mechanics and Hydraulic Machinery (4341903)

Unit I: Fluid and Fluid Properties

Repeated Questions:

1. **Define/Explain Newton's Law of Viscosity.**
 - Appeared in: W23 (Q1c, 07 marks), S23 (Q1a, 03 marks)
2. **Define the following terms: Viscosity, Ideal Fluid, Density.**
 - Appeared in: W23 (Q1a, 03 marks), SUM 24 (Q1a, 03 marks - Density & Viscosity)
3. **Define the following terms: Absolute Pressure, Gauge Pressure, Vacuum Pressure.**
 - Appeared in: W23 (Q1e, 03 marks), SUM 24 (Q2a, 03 marks)
4. **State and prove Pascal's Law.**
 - Appeared in: W23 (Q2c, 07 marks), S25 (Q1c, 07 marks)
5. **Define the following terms: Cohesion, Adhesion, Surface Tension.**
 - Appeared in: W24 (Q1a, 03 marks), S25 (Q1a, 03 marks - Surface Tension)
6. **Differentiate between ideal fluid and real fluid.**
 - Appeared in: SUM 24 (Q1b, 04 marks)

Other Important Questions:

1. **A liquid possesses specific gravity=1.3, pressure head= 40 meter. Convert it into kilo Pascal.**
 - Appeared in: W23 (Q1b, 03 marks)
2. **The pressure outside the droplet of water of diameter 0.02 mm is 1.013 bar. Calculate the pressure within the droplet if surface tension is given as 0.0725 N/m of water.**
 - Appeared in: W24 (Q1b, 04 marks)
3. **Define the term (1) Compressibility (2) Specific weight (3) Specific gravity.**
 - Appeared in: S23 (Q1b, 04 marks)
4. **Give Difference between 1) liquid and gas 2) fluid and solid.**
 - Appeared in: S25 (Q1b, 04 marks)
5. **Define 1. Dynamic Viscosity 2. Real fluid.**
 - Appeared in: S25 (Q1a, 03 marks)

Unit II: Fluid Mechanics and Flow Measurement

Repeated Questions:

1. **State and derive the Continuity Equation.**
 - Appeared in: S25 (Q2b, 04 marks), W24 (Q1c, 07 marks)
2. **Explain the working principle of a Venturimeter with a neat sketch.**
 - Appeared in: S25 (Q2c, 07 marks), S23 (Q3c, 07 marks - related to venturimeter calculation)
3. **State and derive the Momentum Equation.**
 - Appeared in: S25 (Q2b, 04 marks - OR part), W24 (Q2b, 04 marks)
4. **Define Orifice and give its classification.**
 - Appeared in: S25 (Q3b, 04 marks), W24 (Q3b, 04 marks), SUM 24 (Q3a, 03 marks)
5. **Define the following terms: (1) Co-efficient of contraction (2) Co-efficient of velocity (3) Co-efficient of discharge.**
 - Appeared in: S23 (Q4b, 04 marks), S25 (Q2a, 03 marks - OR part)
6. **Explain the construction and working of a U-tube differential manometer with a neat sketch.**
 - Appeared in: S23 (Q2b, 04 marks - OR part), W23 (Q3b, 04 marks)

Other Important Questions:

1. **A rectangular orifice 3 m wide and 2 m deep is discharging water from a tank. If the water level in the tank is 6 m above the top edge of the orifice, find the discharge through the orifice. Take $C_d = 0.6$.**
 - Appeared in: S25 (Q2c, 07 marks - OR part), W23 (Q1d, 07 marks - with 2.5m depth)
2. **Find the discharge through a 6 cm diameter orifice having an 8-meter constant head. Take $C_d = 0.6$.**
 - Appeared in: SUM 24 (Q1c, 07 marks)
3. **Water discharges at the rate of 98.2 lit/sec through a 12 cm diameter vertical, sharp-edged orifice placed under a constant head of 10 m. Find the coefficient of discharge.**
 - Appeared in: W24 (Q1c, 07 marks), SUM 24 (Q1c, 07 marks - OR part)
4. **The diameter of a pipe at the first end is 15 cm and at the other end is 20 cm. Find the discharge through the pipe if the velocity of water flowing through the first end is 5 m/s and also find the velocity at the other end.**
 - Appeared in: S25 (Q1c, 07 marks - OR part)
5. **Explain the working principle of a differential manometer with a neat sketch.**
 - Appeared in: SUM 24 (Q2b, 04 marks - OR part)
6. **Explain the working principle and working of a piezometer with a neat sketch.**
 - Appeared in: SUM 24 (Q2b, 04 marks)
7. **As per figure 1, a simple U-tube manometer is used to measure the pressure of oil (S.G. = 0.9). The level of oil in the left limb is 20 cm below the center line, and the level of mercury is 50 cm above the center line in the right limb, which is open to the atmosphere. Find the pressure of oil in bar.**
 - Appeared in: SUM 24 (Q2c, 07 marks)
8. **Define the following terms: (1) Streamline (2) Stream tube (3) Streak line.**
 - Appeared in: W23 (Q2d, 03 marks), S23 (Q3a, 03 marks), W24 (Q2a, 03 marks)
9. **Water is flowing from a horizontal venturimeter with an inlet diameter = 35 cm and a throat diameter = 20 cm. Piezometer readings at the inlet and throat are 85 cm and 45 cm respectively. If $C_d = 0.98$, calculate the water flow rate in liter/sec.**
 - Appeared in: W23 (Q2c, 07 marks)
10. **Oil of Sp. gravity 0.82 is flowing through a pipe of 30 cm diameter with a velocity of 4 m/s. The diameter of the pipe at the other end is gradually reduced to 25 cm. Find the velocity at that end and also find the mass flow rate of oil.**
 - Appeared in: W24 (Q2c, 07 marks)

Unit III: Flow Through Pipes

Repeated Questions:

1. **Write a short note on Water Hammer.**
 - **Appeared in:** S23 (Q2a, 03 marks), W23 (Q3b, 04 marks - OR part), W24 (Q3a, 03 marks - OR part), SUM 24 (Q4b, 04 marks)
2. **Write a short note on Moody's Chart / Write its advantages.**
 - **Appeared in:** S25 (Q3a, 03 marks - OR part), W23 (Q3a, 03 marks), W24 (Q3a, 03 marks), SUM 24 (Q4a, 03 marks)
3. **Write a short note on a Surge Tank.**
 - **Appeared in:** S23 (Q2a, 03 marks), S25 (Q3b, 04 marks - OR part), W24 (Q3b, 04 marks - OR part)
4. **Explain Reynolds Experiment with a neat sketch.**
 - **Appeared in:** S25 (Q4c, 07 marks), W23 (Q3c, 07 marks - OR part), W24 (Q4c, 07 marks)
5. **Differentiate between Laminar Flow and Turbulent Flow.**
 - **Appeared in:** S23 (Q2b, 04 marks), W23 (Q3a, 03 marks - OR part)
6. **Find the Reynolds Number and state the type of flow for a given set of parameters (Oil/Water, Diameter, Viscosity, Discharge/Velocity).**
 - **Appeared in:** S23 (Q2c, 07 marks), W23 (Q3c, 07 marks), S25 (Q3c, 07 marks), W24 (Q3c, 07 marks), SUM 24 (Q4c, 07 marks)

Other Important Questions:

1. **Define the following terms: (1) Laminar flow (2) Turbulent flow (3) Critical velocity.**
 - **Appeared in:** SUM 24 (Q4a, 03 marks - OR part)
2. **In a pipe of diameter 350 mm and length 75 m, water is flowing at a velocity of 2.8 m/s. Take the coefficient of friction $f = 0.00263$ and find the head lost due to friction using: (i) Darcy-Weisbach formula; (ii) Chezy's formula ($C=55$).**
 - **Appeared in:** S23 (Q2c, 07 marks - OR part)
3. **Calculate the head loss due to friction for a pipe carrying water of 1.5 m diameter and 2 km length having a velocity of water 2 m/s by using Darcy's formula. Take $f = 0.006$.**
 - **Appeared in:** SUM 24 (Q4c, 07 marks - OR part)
4. **Define the following terms: (1) Steady flow (2) Uniform flow (3) Laminar flow.**
 - **Appeared in:** S25 (Q2a, 03 marks)
5. **Differentiate between: 1) Steady and Unsteady flow 2) Rotational and Irrotational flow.**
 - **Appeared in:** SUM 24 (Q3b, 04 marks)
6. **Differentiate between: 1) Uniform and Non-uniform flow 2) Compressible and Incompressible flow.**
 - **Appeared in:** SUM 24 (Q3b, 04 marks - OR part)
7. **Classify Flow measuring devices.**
 - **Appeared in:** SUM 24 (Q3a, 03 marks - OR part)

Unit IV: Hydraulic Machines

Repeated Questions:

1. **Explain the construction and working of a Centrifugal Pump with a neat sketch.**
 - Appeared in: S23 (Q4c, 07 marks), W23 (Q4c, 07 marks)
2. **Explain the construction and working of a Reciprocating Pump with a neat sketch.**
 - Appeared in: S25 (Q3c, 07 marks - OR part), W23 (Q5f, 07 marks), W24 (Q3c, 07 marks - OR part)
3. **Differentiate between a Centrifugal Pump and a Reciprocating Pump.**
 - Appeared in: W23 (Q4b, 04 marks), SUM 24 (Q5b, 04 marks)
4. **Write a short note on Priming.**
 - Appeared in: S23 (Q5a, 03 marks), S25 (Q4a, 03 marks), W24 (Q4a, 03 marks - OR part)
5. **Write a short note on an Air Vessel.**
 - Appeared in: S25 (Q4a, 03 marks - OR part), W23 (Q4a, 03 marks - OR part)
6. **Explain the construction and working of a Pelton Wheel Turbine with a neat sketch.**
 - Appeared in: S25 (Q5c, 07 marks - OR part), W24 (Q5c, 07 marks)
7. **Differentiate between a Francis Turbine and a Kaplan Turbine.**
 - Appeared in: W24 (Q5a, 03 marks), SUM 24 (Q5b, 04 marks - OR part)
8. **Find the power required to drive a pump (Centrifugal/Reciprocating) given its discharge, head, and efficiency.**
 - Appeared in: S23 (Q5c, 07 marks), S25 (Q4c, 07 marks - OR part), W23 (Q4c, 07 marks - OR part)

Other Important Questions:

1. **Draw a line diagram of a Francis turbine and label its main parts.**
 - Appeared in: S23 (Q4a, 03 marks)
2. **Draw a line diagram of a Hydro-electric power plant and label its main parts.**
 - Appeared in: S23 (Q4a, 03 marks - OR part)
3. **Explain the following terms: (1) Impulse turbine (2) Hydraulic machine (3) Cavitation (4) Suction depth.**
 - Appeared in: S23 (Q4b, 04 marks - OR part)
4. **Explain Draft Tube in detail with a neat sketch.**
 - Appeared in: S23 (Q4c, 07 marks - OR part)
5. **Explain the construction and working of a Hydraulic Coupling with a sketch.**
 - Appeared in: S23 (Q5b, 04 marks)
6. **Explain the construction and working of a Hydraulic Intensifier with a sketch.**
 - Appeared in: S23 (Q5b, 04 marks - OR part), SUM 24 (Q5c, 07 marks - OR part)
7. **Define the term Draft Tube and write down its advantages.**
 - Appeared in: S23 (Q5a, 03 marks - OR part)
8. **A Single-acting reciprocating pump, running at 50 rpm, delivers 600 lit/min of water. The diameter of the piston is 200 mm and the stroke length is 400 mm. Determine: 1. The power required to drive the pump if the efficiency is 88%. 2. The coefficient of discharge of the pump.**
 - Appeared in: S23 (Q5c, 07 marks - OR part)
9. **Write a short note on a Hydraulic Press.**
 - Appeared in: S25 (Q4b, 04 marks)
10. **Write a short note on a Hydraulic Ram.**
 - Appeared in: W23 (Q4b, 04 marks - OR part), W24 (Q4b, 04 marks)
11. **Explain the working of a Hydraulic Ram with a neat sketch.**
 - Appeared in: W24 (Q5c, 07 marks - OR part)
12. **Write a short note on a Hydraulic Accumulator.**

- Appeared in: S25 (Q4b, 04 marks - OR part)
- 13. **Explain the concept of a Vane Pump with a neat sketch.**
 - Appeared in: S25 (Q5a, 03 marks)
- 14. **Explain the concept of a Gear Pump with a neat sketch.**
 - Appeared in: W23 (Q5a, 03 marks)
- 15. **Write down the applications of a pump.**
 - Appeared in: SUM 24 (Q5a, 03 marks)
- 16. **Explain the construction, working, and application of a Hydraulic Press with a sketch.**
 - Appeared in: SUM 24 (Q5c, 07 marks)
- 17. **Give the name of any three hydroelectric power stations along with the type of turbine used in India.**
 - Appeared in: SUM 24 (Q5a, 03 marks - OR part)
- 18. **Find the specific speed of a centrifugal pump.**
 - Appeared in: W23 (Q5e, 04 marks), W24 (Q5b, 04 marks - OR part)
- 19. **Write advantages and disadvantages of a Kaplan turbine.**
 - Appeared in: S25 (Q5b, 04 marks - OR part)
- 20. **Write advantages and disadvantages of a Francis turbine.**
 - Appeared in: W23 (Q5d, 03 marks)
- 21. **Classify Hydraulic Turbines in detail.**
 - Appeared in: S23 (Q3b, 04 marks - OR part)
