MODULE 1 – Properties of Fluids

Theory Questions

1. Define **viscosity** and state **Newton's law of viscosity**.
2. Explain **surface tension and capillarity**.
3. Explain **types of fluids**.
4. Define:
    - Density
    - Specific weight
    - Specific gravity
5. Define **vapour pressure**.

Numericals

1. A plate **0.08 mm** apart from fixed plate requires shear stress **2.25 N/m²** to move with velocity **1.8 m/s**. Determine viscosity.
2. Calculate **capillary rise in tube**.

MODULE 2 – Fluid Statics

Theory Questions

1. State and derive **Pascal's law**.
2. Explain **equilibrium of floating bodies**.
3. Define:
    - Metacentre
    - Metacentric height
4. Explain **buoyancy**.
5. Derive **total pressure on submerged vertical plate**.
6. Define:
    - Absolute pressure
    - Gauge pressure
    - Vacuum pressure
7. Explain **hydrostatic paradox**.

Numericals

1. Pressure intensity **4 m below sea water surface**.
2. Differential manometer problem (oil + mercury).

3. Calculate **metacentric height of floating cylinder**.
4. Determine **centre of pressure on submerged plate**.

MODULE 3 – Fluid Kinematics & Dynamics

Theory Questions

1. State **Bernoulli's theorem** for steady incompressible flow.
2. State **assumptions of Bernoulli's theorem**.
3. Explain **Reynolds experiment**.
4. Define:
    - Fluid statics
    - Fluid kinematics
5. Define:
    - Streamline
    - Pathline
    - Streakline
6. Define:
    - Steady flow
    - Unsteady flow
7. Explain **flow classification**.

Numerical

1. Apply **Bernoulli equation to pipe flow**.
2. Determine **velocity using Bernoulli equation**.

Analytical Question

1. Show that **stream function satisfies continuity equation**.

MODULE 4 – Flow Measurement Devices

Theory Questions

1. Explain **Venturimeter with equation**.
2. Explain **Orificemeter**.
3. Explain **hydraulic coefficients of orifice**:
    - Coefficient of contraction
    - Coefficient of velocity
    - Coefficient of discharge

4. Classification of **orifices**.
5. Difference between **orifice and mouthpiece**.
6. Define:
    - Weir
    - Orifice
    - Pitot tube

Numericals

1. **Venturimeter discharge calculation**
    - Diameter 30 cm and 15 cm.
2. **Triangular notch discharge**

Head over **90° V-notch = 0.40 m**

3. **Orifice discharge calculation**
4. **Differential manometer in venturimeter**

MODULE 5 – Flow Through Pipes

Theory Questions

1. Explain **major and minor losses in pipe flow**.
2. Explain **Hydraulic Gradient Line (HGL)**.
3. Explain **Total Energy Line (TEL)**.
4. Explain **pipes in series and parallel**.
5. Define **Darcy–Weisbach equation**.
6. Explain **Couette flow**.

Numericals

1. Pipe **100 mm diameter**, pressure difference **0.6 m**, distance **50 m** → find discharge.
2. Head loss calculation in pipe.
3. Equivalent pipe diameter problems.

MODULE 6 – Open Channel Flow

Theory Questions

1. Explain **Hydraulic Jump**.
2. Explain **Specific energy diagram**.
3. Define:

- Uniform flow
- Non-uniform flow

4. Define **Rapidly varied flow**.
5. Velocity distribution in open channel.

Numericals

1. **Most economical trapezoidal channel section**

Prove:
Half top width = length of sloping side.

2. Discharge calculation for trapezoidal channel:

- Bed width = 7.5 m
- Side slope = 1:1
- Depth = 2 m
- Manning's constant = 0.015

MODULE 7 – Dimensional Analysis

Theory Questions

1. Explain **Buckingham π theorem** with example.
2. Explain **dimensional homogeneity**.
3. Define **model and prototype**.
4. Explain **dimensionless parameters**.