

**SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR**

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Total number of pages: { 2 }

**B.Tech. || ME || 4thSem**

**Fluid Mechanics**

**Subject Code: BTME-403 (RP)**

**Paper ID: M/18**

*(2011-2014 batch)*

**Time allowed: 3 Hrs**

**Max Marks: 60**

**Important Instructions:**

- All questions are compulsory
- Assume any missing data

**PART A (10x 2marks)**

**Q. 1. Short-Answer Questions:**

- Explain Newton's Law of Viscosity.
- What is Mach Number? Give examples of flow situations in which it is applicable.
- Compare Venturi-meter and Orifice-meter.
- Distinguish between Notch and Weir.
- What are minor losses in pipe flow?
- What are the applications of impulse momentum principle?
- Give assumptions for deriving the Bernoulli's equation for steady flow.
- What do you mean by local and convective acceleration?
- For a mercury column of 20 cm, calculate the intensity of pressure in Kpa and express the pressure in cm of water column.
- State Pascal's Law and give its engineering applications.

**PART B (5x8marks)**

- Q. 2.**
- Define compressibility. How it is related to bulk modulus of elasticity. CO1
  - Two horizontal flat plates are placed 0.15 mm apart and the space between them is filled with an oil of viscosity 1 poise. The upper plate of area  $1.5 \text{ m}^2$  is required to move with a speed of 0.5 m/s relative to the other plate.

**OR**

- What do you mean by surface tension and capillarity. Derive the expression for capillary rise and depression. CO1
- A solid cylinder of 2 m diameter and 1 m height is made up of a material of specific gravity 0.7 and floats in water. Find the meta-centric height.

Q. 3. a) Discuss the stability conditions of a floating body partially submerged in water. CO2

b) A rectangular plate 2m X 3m is immersed in water in such a way that its greatest and least depths are 6m and 4m respectively from the water surface. Calculate the total pressure on the plate.

OR

What do you mean by Hydrostatic Paradox? Explain

CO2

Q. 4. a) Derive continuity equation for incompressible flow in Cartesian coordinates CO3

b) A pipe AB branches into two pipes C and D. The pipe has diameter of 45 cm at A, 30 cm at B, 20 cm at C and 15 cm at D. Determine the discharge at A if the velocity at A is 2 m/s. Also determine the velocities at B and D, if the velocity at C is 4 m/s.

OR

What are minor losses in pipe flow? Under what condition this can be neglected? Derive an expression for head loss due to sudden enlargement in pipe diameter.

CO3

Q. 5. What is the need of similitude. Explain dynamic similarity between Model and Prototype. CO4

OR

Derive the expression for Reynolds number and give its significance.

CO4

Q. 6. Explain the principle of discharge measurement in a pipe flow. List the various devices used for flow measurement. CO5

OR

Give the construction and working of Pitot tube to measure the velocity of flow in a pipe. CO5