

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– III (New) EXAMINATION – WINTER 2019****Subject Code: 2130101****Date: 30/11/2019****Subject Name: Fundamentals of Fluid Mechanics****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.

- Q.1** (a) Define viscosity and Derive unit of viscosity. **03**
(b) Differentiate following terms. **04**
(i) Ideal Fluid and Real Fluid (ii) Model and Prototype
(c) State Hydrostatic Law and prove Pascal's law. **07**

- Q.2** (a) Derive an expression for capillary fall between two vertical parallel plates. **03**
(b) Explain Weber's number and model law. **04**
(c) The pressure difference Δp in a pipe of diameter D and length l due to turbulent flow depends on the velocity v , viscosity μ , density ρ and roughness k . Using Buckingham's π -theorem, obtain an expression for Δp . **07**

OR

- (c) The Resisting force R of a supersonic plane during flight can be considered as dependent upon the length of the aircraft l , velocity v , air viscosity μ , air density ρ & bulk modulus of air k . Express the functional relationship between these variables & resisting force. **07**
- Q.3** (a) Define following terms: **03**
(i) Buoyancy (ii) Metacentric Height (iii) Turbulent Flow
(b) Differentiate following terms. **04**
(i) Manometer and Piezometer (ii) Uniform and Non Uniform Flow
(c) A circular plate 1.5 m diameter is immersed in water in such a way that its greatest and least depth below the free surface is 2 m & 0.75 m respectively. Determine the total pressure on one face of the plate & position of the centre of pressure. **07**

OR

- Q.3** (a) Define following terms: **03**
(i) Absolute Pressure (ii) Discharge (iii) Laminar Flow
(b) Compare Venturimeter and Orificemeter. **04**
(c) Derive Continuity equation for 2 and 3 Dimensional Flow with neat Sketch. **07**
- Q.4** (a) Explain Hydrostatic paradox. **03**
(b) Explain different types of fluid flow with examples. **04**
(c) Derive expression of Total pressure and Centre of pressure for Horizontal plane surface submerged in liquid. **07**

OR

- Q.4** (a) Differentiate between distorted and undistorted model. **03**
(b) Explain Mach number. **04**
(c) Derive an expression for Bernoulli's theorem with the help of Euler's equation. Clearly state assumptions made. **07**

- Q.5 (a) Define: Velocity gradient and Convective acceleration. **03**
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- (b) The diameter of a pipe at the section 1-1 and 2-2 are 200 mm and 300 mm respectively. If the velocity of water flowing through the pipe at section 1-1 is 4 m/s, find **04**
- (i) Discharge through the pipe, and
(ii) Velocity of water at section 2-2
- (c) Write note on Venturimeter with neat sketch and derive equation for theoretical discharge. **07**

OR

- Q.5 (a) Differentiate between Notch and Weirs. **03**
- (b) Write short note on Frames of Reference. **04**
- (c) Derive equation for discharge over Triangular notch. **07**

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