Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) • EXAMINATION – SUMMER 2015

Subject Code: 2130101 **Date: 09/06/2015**

Subject Name: Fundamentals of Fluid Mechanics

Time: 02.30pm-05.00pm **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 Following. **07**

i. Buoyancy
ii. Fluid
iii. Stream line
iv. Turbulent Flow
v. Potential Flow
vi. Metacentre
vii. Subsonic Flow

(b) Derive equation to calculate the resultant force & centre of pressure on a vertical plane surface submerged in liquid. **07**

Q.2 **(a)** State Bernoulli's Theorem. What are the assumptions for Bernoulli's Theorem? Derive Bernoulli's equation with suitable diagram. **07**

(b) Explain the theory of small orifices discharging to atmosphere and derive an equation of coefficient of velocity (C_v). **07**

OR

(b) What is Manometer? Explain Piezometer and also state its limitations. **07**

Q.3 **(a)** State and Prove Pascal's law. **07**

(b) Using Rayleigh's method, determine the rational formula for power developed by pump when power (P) depends upon the head H, the discharge (Q) and specific weight w of the fluid. **07**

OR

Q.3 **(a)** An orifice meter with orifice diameter 200 mm is fitted in a pipe of 400 mm diameter. The pressure measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 600 mm of mercury. Determine the rate of flow of oil of sp. Gr. 0.9 when the co-efficient of discharge of the meter = 0.62. **07**

(b) Write a short note on Surface Tension. Also calculate surface tension on liquid droplet. **07**

Q.4 **(a)** What do you mean by Continuum? Derive Continuity Equation for 2D and 3D in Cartesian Coordinate systems with suitable assumptions. **07**

(b) A particular aircraft flies at altitude 12 km, its speed is 100 km/hr less than that speed when it flies at sea level at same mach number. Calculate the mach number at which the aircraft flies. The temperature of air at sea level and at 12 km above sea level is 20°C and -52°C respectively. Assumer R = 0.287 kJ/kg K, γ = 1.4. **07**

OR

Q.4	**(a)**	Define Circulation and Vorticity. Derive an equation for circulation as well as vorticity.	**07**
	(b)	A cylindrical body of diameter 0.5 m and height 1 m, weighs 130 N in water. Calculate its weight in air.	**07**
Q.5	**(a)**	What is Reynold's Number? Write a note on Reynold's Experiment.	**07**
	(b)	A water flows through a 200 mm diameter pipe. The static pressure in pipe is 90 mm of mercury (vacuum). The stagnation pressure at the centre of the pipe recorded by the pitot tube is 10 kN/m^2. Determine flow rate through pipe, if the mean velocity of flow is 0.8 times of central velocity. Take $C_v = 0.98$.	**07**

OR

Q.5	**(a)**	Define Sound Velocity and Mach number. Based on Mach number what are the types of flow?	**07**
	(b)	A horizontal venturimeter of 200mm x 100mm is used to measure the discharge of an oil of specific gravity 0.85. A mercury manometer is used for the purpose. If the discharge is 100 litres per second and if the coefficient of discharge of the venturimeter is 0.97, find the difference of mercury level in between two limbs of manometer.	**07**

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