Seat No.: ________ Enrolment No. ________

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (Old) EXAMINATION – WINTER 2019

Subject Code: 130101 **Date: 26/11/2019**

Subject Name: 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 Following Terms **07**
(1) Mass density
(2) Specific volume
(3) Specific gravity
(4) Capillarity
(5) Dynamic viscosity
(6) Compressibility
(7) Surface tension

(b) A 50 mm diameter shaft rotates with 500 rpm in a 80mm long journal bearing with 51mm internal diameter. The annular space between the shaft and bearing is filled with lubricating oil of dynamic viscosity 1 poise. Determine the torque required and power absorbed to overcome friction. **07**

Q.2 **(a)** Explain different types of manometers and explain the working of differential U-tube manometer. **07**

(b) State and Prove Pascal's law **07**

OR

(b) Explain the condition of stability for a submerged and floating body with neat diagram. **07**

Q.3 **(a)** Derive an expression for continuity for 3-D flow and reduce it for steady incompressible 2-D flow in Cartesian coordinate system. **07**

(b) Define Buoyancy and centre of buoyancy. Calculate the volume of water displaced and position of centre of buoyancy for a wooden block (density 680 kg/m^3) of width 3m and depth 2m, when it flows horizontally in water. The length of wooden block is 5m. **07**

OR

Q.3 **(a)** Define total hydrostatic force and centre of pressure. Derive an expression for both when the surface is vertically immersed. **07**

(b) Explain the construction and working of a Venturimeter and also derive an expression for the discharge through it. **07**

Q.4 **(a)** Define notch and weir. Derive an expression for discharge over triangular notch. **07**

(b) The head of water over an orifice of diameter 7.5 cm is 7.5 m. The jet of water coming out from the orifice is collected in a tank having cross-sectional area of 1 m x 1 m. The rise of water level in this tank is 0.87 m in 25 seconds. The coordinates of a point on the jet measured from venacontracta are 3.75 m horizontal and 0.5 m vertical. Find the co-efficient of discharge, co-efficient of velocity and coefficient of contraction. **07**

OR

Q.4 **(a)** Derive Darcy Weisbach equation with usual notation. **07**

(b) Define circulation and velocity potential function. Explain flow net and state the importance of flow net. **07**

Q.5	**(a)**	Derive an expression for the velocity distribution for viscous flow through a circular pipe. Also sketch the velocity distribution and shear stress distribution across a section of the pipe.	**07**
	(b)	State the different methods for measurement of viscosity. Explain any one of them.	**07**

OR

Q.5	**(a)**	State Buckingham's π theorem. What do you mean by repeating variables? How are the repeating variables selected in dimensional analysis?	**07**
	(b)	State Bernoulli's theorem for compressible fluid flow and derive an expression for the same when the process is adiabatic.	**07**

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