

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– III (New) EXAMINATION – WINTER 2019****Subject Code: 2130502****Date: 3/12/2019****Subject Name: Fluid Flow Operation****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.

	Marks
Q.1 (a) State and explain Newton's law of viscosity.	03
(b) Define: (i) Fluids (ii) specific gravity (iii) Potential flow (iv) Fully developed flow	04
(c) Discuss the concept of hydrostatic equilibrium and derive mathematical condition of hydrostatic equilibrium.	07
Q.2 (a) Define drag and drag coefficient.	03
(b) Discuss the Rheological classification of fluids	04
(c) Starting with necessary, derive the Bernoulli's equation. Also Explain the corrections factors applied to it.	07
OR	
Q.2 (c) Calculate the power to pump a liquid at the rate of 1.5 kg/s from a ground level tank at atmospheric pressure through a 50mm ID steel pipe to an overhead tank 3m above at 2 kg/cm ² pressure. The distance between the two tanks is 500m. Efficiency of the pump is 70%. The density and viscosity of the liquid is 1500 kg/m ³ and 20 cp respectively. Friction factor $f = 16/NRe$.	07
Q.3 (a) Water of density 1 gm/cc and viscosity 1 cP is flowing in a pipe of 25mm ID at the rate of 100 kg/min. Calculate the Reynolds number and find the type of flow.	03
(b) Show that average velocity is one – half of the maximum velocity for laminar flow of incompressible Newtonian fluid through a circular pipe.	04
(c) Derive Continuity Equation.	07
OR	
Q.3 (a) What is boundary layer? Explain boundary layer separation.	03
(b) Derive Hagen-Poiseuille equation.	04
(c) Derive an expression for loss of head due to sudden expansion or enlargement of flow area.	07
Q.4 (a) What is Mach number? Give its significance for the application of mach number for compressible	03
(b) List any two types of valves with their industrial applications.	04
(c) Discuss principle, construction and working of Venturimeter and derive its flow equation.	07

OR

- Q.4** (a) What is principle of working of a convergent-divergent nozzle? **03**
(b) List different fittings used to prevent leakage around moving parts. **04**
(c) Sulfuric acid of density 1300 kg/m^3 is flowing through a pipe of 50mm ID. An orificemeter of 10mm diameter is fitted in the pipe. A mercury (sp. gr 13.6) manometer fitted to the system measures the differential pressure as 10cm. Calculate the mass flow rate of the acid in kg/hr. Assume orifice coefficient as 0.61. **07**
- Q.5** (a) What is minimum fluidization velocity? **03**
(b) Discuss types of fluidization with example. **04**
(c) Discuss the working of centrifugal pump and different types of impellers used in a centrifugal pump. **07**

OR

- Q.5** (a) Define cavitation and priming. **03**
(b) Write a short note on blowers and compressors. **04**
(c) For the flow of fluid through long straight and circular pipe, the pressure drop due to friction depends upon the following variables, Diameter of pipe (D), length of pipe (L), velocity of fluid (u), density of fluid (ρ), viscosity of fluid (μ), and frictional head loss (K). Obtain the relationship between pressure drop and the variables. **07**
Use Buckingham's π method of dimensional analysis.

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