

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III (NEW) EXAMINATION – SUMMER 2021****Subject Code:3130502****Date:06/09/2021****Subject Name:Fluid Flow Operations****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
Q.1	(a) Define:	03
	(i) Potential flow (ii) Streamline flow (iii) Momentum diffusivity	
	(b) Describe the behavior of Newtonian and Non Newtonian fluid with the help of figure and example	04
	(c) Derive the Bernoulli's equation. Write the necessary assumptions. Explain the corrections applied to it.	07
Q.2	(a) Define (i) Mass Velocity (ii) Average Velocity	03
	(b) Discuss velocity Distribution for laminar flow of Newtonian Fluids in a circular channel.	04
	(c) Discuss the concept of hydrostatic equilibrium and derive mathematical condition of hydrostatic equilibrium.	07
OR		
	(c) The temperature of the earth's atmosphere drops about 5° C for every 1000m of elevation above the earth's surface. If the air temperature at ground level is 15° C and the absolute pressure is 760 mm hg, at what elevation is the pressure 380 mm hg? Assume that air behaves as an ideal	07
Q.3	(a) If a liquid enters a pipe of diameter d with a velocity v, what will it's velocity at the exit if the diameter reduces to 0.5 times the initial diameter?	03
	(b) Discuss flow of compressible fluid through convergent – divergent nozzle.	04
	(c) Derive an expression for head loss due to sudden expansion in flow area.	07
OR		
Q.3	(a) Sulfuric acid is pumped at 30 kg/min through a 60 m length of Smooth 25 mm pipe. Calculate the drop in pressure. $\rho = 1840 \text{ kg/m}^3$, Viscosity=25 cp	03
	(b) Derive Continuity equation for compressible fluids.	04
	(c) An oil of specific gravity 0.7 is flowing through a pipe of diameter 300 mm at the rate of 500 lit/sec. find the head loss due to friction and power requirement to maintain the flow for a length of 1000 meter. Momentum diffusivity of oil is 0.29 stock.	07
Q.4	(a) Show that kinetic energy correction factor $\alpha = 2$ for laminar flow of incompressible Newtonian fluid through a circular pipe.	03
	(b) Define Mach number and explain its significance.	04
	(c) Define NPSH. And also derive the equation of NPSH.	07
OR		
Q.4	(a) Illustrate the detailed classification of pumps.	03
	(b) Time period of the pendulum depends upon length (l) of the pendulum and acceleration due to gravity (g). Derive the expression for the time period.	04
	(c) Explain construction and working of venturimeter With neat sketch, and also derive the flow equation of the same.	07

- Q.5** (a) Differentiate pipes and tubes. **03**
(b) Explain the concept of drag force with example. **04**
(c) Sulphuric acid is to be pumped at a rate of 3 kg/s through a 50 mm i.d. pipe over a straight run of 800 m and is then raised vertically 15 m. If the pump is electrically driven and has an efficiency of 50%, find the power required by the pump. Density=1650kg/m³.viscosity of the acid=0.0086 Pa.s. **07**

OR

- Q.5** (a) List various types of valves and mention their specific application in chemical industry. **03**
(b) Find the expression of power P developed by the pump, when the P depends upon head H, the discharge Q and specific weight w of the fluid. **04**
(c) Two geometrically similar pumps are running at the same speed of 1000 r.p.m ,one pump has an impeller diameter of 0.30m and lift water at a rate of 20 lit/sec against head of 15m, determine head and impeller diameter of the other pump to deliver half the discharge. **07**
