Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – V (NEW) EXAMINATION – WINTER 2015

Subject Code: 2153507 **Date:05/12/2015**

Subject Name: Elements of Fluid Flow

Time:10:30am to 1:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

1	(a)	Write a short note on compressible and incompressible flow and laminar and turbulent flow.	07
1	(b)	State Newton's law of viscosity and explain rheology of fluids.	07
2	(a)	What are different types of manometers available, explain with neat diagram.	07
2	(b)	A U tube differential manometer containing mercury is connected on one side to pipe A containing carbon tetrachloride (sp.gr. 1.6) under a pressure of 120 kPa, and on the other side to pipe B containing oil (sp gr 0.8) under a pressure of 200 kPa. The pipe A lies 2.5 m above pipe B and the mercury level in the limb connecting with pipe A lies below 4 m below the pipe A. Determine the difference in levels of mercury in the two limbs of the manometer. (sp gr water 9.81).	07
		OR	07
2	(b)	Define Reynolds number. Also calculatethe Reynolds number and find the type of flow for water flowing at 20°C in a pipe of 20 mm ID at the rate of 1000 kg/min.	07
3	(a)	Derive an expression for pressure-density-height relationship.	07
3	(b)	Discuss boundary layer separation and wake formation.	07
		OR	
3	(a)	Derive the Bernoulli equation without friction.	07
3	(b)	Water flows in a circular pipe. At one section the diameter is 0.3 m, the static pressure is 260kPa, the velocity is 3m/s and the elevation is 10m above ground level. The elevation at the section downward is 0m, and the pipe diameter is 0.15m. Find out the gauge pressure at the downward section.	07

OR

4	(a)	Discuss friction loss from sudden expansion and sudden contraction of cross section of pipe through which incompressible fluid is flowing.	07
4	(b)	Briefly describe the construction and working of orifice meter and derive expression for orifice coefficient.	07

OR

4	(a)	Explain fully developed flow. Also discuss concept of transition length for laminar and turbulent flow.	07
4	(b)	Classify different types of flow meter. Also differentiate variable head meter and variable area meter.	07
5	(a)	Derive the differential continuity equation for two dimensional flow.	07
5	(b)	The velocity potential for a two dimensional flow is $\emptyset = x(2y - 1)$, determine the velocity at the point P (4,5). Also obtain the value of stream function at this point P.	07

OR

5	(a)	Explain different steps of finding dimensional analysis by Buckingham's Pi theorem. Describe the criteria of choosing repeating variables.	07
5	(b)	The resistance R experienced by a partially submerged body depends upon the velocity V, length of the body l, viscosity of the fluid μ, density of the fluid ρ and gravitational acceleration g. Obtain a dimensionless expression for R by Buckingham's-Pi theorem.	07

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