Date:06/05/2016

Total Marks: 70

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) - EXAMINATION - SUMMER 2016

Subject Code:2153507

Subject Name: Elements of Fluid Flow

Time:02:30 PM to 05:00 PM

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Explain Newtonian and Non-Newtonian fluids with their corresponding stress 07 strain curves and examples?
 - (b) Derive an equation for hydrostatic equilibrium with an appropriate figure and 07 assumption
- Q.2 (a) Define center of pressure. Also write a short note on different pressure measuring 07 instrument.
 - (b) Determine Reynolds number and type of flow for polymer melt with a density of 07 900 kg/m³ and viscosity of 1Pa-s flowing at 0.2 m/s in a 20 mm tube

OR

- (b) Discuss Reynolds number with reference to Reynolds experiment and its 07 significance.
- Q.3 (a) Derive Bernoulli's equation without friction
 - (b) A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 20 cm of mercury. Determine the rate of flow. Take Cd = 0.98

OR

- Q.3 (a) Write a detail note on Boundary layer formation in straight pipe. 07
 - (b) A "U"-tube manometer containing mercury of density 13600 kg/m3 is used to measure the pressure drop along a horizontal pipe. If the fluid in the pipe has a specific gravity of 0.8 and the manometer reading is 0.6m, what is the pressure difference measured by the manometer?
- **Q.4** (a) Explain the following terms
 - i) Steady and Unsteady flow
 - ii) Uniform and non-uniform flow
 - iii) Laminar and turbulent flow
 - iv) Compressible and Incompressible flow
 - (b) Derive an expression of head loss due to sudden expansion of flow area for steady flow of incompressible fluids.07

OR

- Q.4 (a) Differentiate between variable head flow meters and variable area flow meters. 07 Briefly describe the construction and working of venture meter.
 - (b) The stream function for a two dimensional flow is given by $\psi = 2xy$, calculate 07 the velocity at point P (2, 3). Find the velocity potential φ .
- Q.5 (a) Classify different flow meters. Also write a short note on notches and weir 07

07

07

(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.

Q.5 (a)Establish the non-dimensionality of following:
(i) Froude number, (ii) Weber number, (iii) Euler number07

(b) The pressure drop ΔP in pipe of diameter *D* and length 1 depends on the density ρ and viscosity μ , of the flowing fluid, mean velocity *V* of flow and average height of protuberance *t*. Show that the pressure drop can be expressed in the form: $\Delta P = \rho V^2 f\left(\frac{l}{D}, \frac{\mu}{VD\rho}, \frac{t}{D}\right)$
