

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE – SEMESTER – VI (NEW).EXAMINATION – WINTER 2016**

**Subject Code: 2160602**

**Date: 24/10/2016**

**Subject Name: Applied Fluid Mechanics**

**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.

- Q.1** (a) Derive the equation for calculating loss of head due to sudden enlargement. **07**  
(b) Prove that Maximum Velocity is equal to one and half times the average velocity for flow between fixed parallel plate. **07**

- Q.2** (a) Derive “Darcy Weisbach” formula for the loss of head due to friction in pipe line. **07**  
(b) A horizontal pipe of 150 mm diameter is suddenly enlarged to 300 mm diameter. The rate of flow of water through a pipe is  $0.2 \text{ m}^3/\text{sec}$ . The pressure intensity of smaller pipe 125 kPa. Determine (i) Loss of head due to sudden enlargement (ii) Pressure intensity in large pipe. **07**

**OR**

- (b) A pipe of diameter of 20 cm conveying water. Calculate the discharge when centre line velocity is 3 m/sec and velocity at a point 4 cm from centre is 2.5 m/sec. **07**
- Q.3** (a) What is displacement Thickness? Derive the expression for displacement thickness of boundary layer flow. **07**  
(b) If velocity distribution in laminar boundary layer over a flat plate is assumed to be given by second order polynomial  $u = a + by + cy^2$ , determine its form using the necessary boundary condition. **07**

**OR**

- Q.3** (a) The efficiency ( $\eta$ ) of fan depends on density ( $\rho$ ), dynamic viscosity ( $\mu$ ), angular velocity ( $\omega$ ), diameter ( $D$ ) & discharge ( $Q$ ). Express efficiency ( $\eta$ ) in terms of dimensionless parameter. **07**  
(b) What is afflux? Derive the expression for length of Back water curve. **07**
- Q.4** (a) Prove that for trapezoidal channel of most economical section half of top width is equal to length of one of the sloping side. **07**  
(b) Find out bed slope of trapezoidal channel of bed width 4 m, depth of water 3m and side slope of 2 horizontal to 3 vertical. When discharge through channel is  $20 \text{ m}^3/\text{sec}$ . Take Manning’s Constant  $N = 0.03$ . **07**

**OR**

- Q.4** (a) Define: Critical flow, Critical depth, Alternate depth, Subcritical flow. Draw the specific energy curve for constant discharge in an open channel. **07**  
(b) A circular channel of 2 m diameter carries water at a depth of 0.8 m. If the bed slope of the channel is 1500. Find the discharge through the channel. Take chezy’s constant  $C = 50$ . **07**
- Q.5** (a) Compare Impulse turbine and Reaction Turbine. **07**

**(b)** Explain construction and working of a pelton wheel. **07**

**OR**

**Q.5 (a)** Define: Volumetric efficiency, mechanical efficiency, hydraulic efficiency, Overall Efficiency. **07**

**(b)** Explain the Buckingham's  $\pi$ - theorem for dimensional analysis. **07**

\*\*\*\*\*