

Seat No.: _____
No. _____

Enrolment

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 711201N

Date: 01-12-2014

Subject Name: Advanced Fluid Mechanics

Time: 10:30 am - 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) Classify and explain the open channel flow. **07**
(b) What is water surface profile? Explain channel bed slopes and flow profiles. **07**
- Q.2** (a) Derive non-uniform flow equation for rectangular open channel. **07**
(b) Explain channel transitions and obtained condition to determine u/s depth of the channel transition. **07**

OR

- (b) Describe positive and negative surges of the channel. **07**
- Q.3** (a) The differential equation of the water surface profile behind a dam is **07**

$$\frac{dy}{dx} = 0.001 \frac{3^{10/3} - v^{10/3}}{y^{3-1}}$$

The boundary condition is : at $x = 0$, $y = 10\text{m}$. Solve this differential equation by finite difference method.

- (b) What is FEM? Explain how the FEM is applied for transient flow in open channel. **07**

OR

- Q.3** (a) Write short note on spatially varied flow. **07**
(b) Write the three basic equations of fluid mechanics and derive the third equation. **07**
- Q.4** (a) Explain water hammer analysis. **07**
(b) What is skin drag? Derive general equation for the force exerted on a body placed in a moving fluid. **07**

OR

- Q.4** (a) Write short note on Magnus effect. **07**
(b) Derive equations for σ , τ_0 and C_d when the velocity distribution is **07**
 $u/U = 2(y/\sigma) - 2(y/\sigma)^3 + (y/\sigma)^4$

- Q.5** (a) Derive momentum equation to analyse the flow in the boundary layer. **07**
(b) Draw and explain Stanton's curves for turbulent flow. **07**

OR

- Q.5** (a) Derive universal velocity distribution equation for turbulent flow. **07**
(b) Explain laminar flow and derive an equation to indicate relationship of shear stress and pressure gradient. **07**
