

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (OLD) EXAMINATION – SUMMER 2022****Subject Code:160602****Date:16/06/2022****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.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Defined the term “Most economical section of channel”. Derive the conditions for the most economical rectangular channel section. **07**
- (b) Differentiate between: (1) Steady flow and unsteady flow (2) Uniform flow and non-uniform flow (3) laminar flow and turbulent flow. **07**
- Q.2** (a) Write short note on cavitation in hydraulic machines. **07**
- (b) A crude oil of viscosity 0.9 poise and specific gravity 0.8 is flowing through a horizontal circular pipe of diameter 80 mm and of length 15 m. Calculate the difference of pressure at the two ends of the pipe, if 50 kg of the oil is collected in a tank in 15 seconds. **07**
- OR**
- (b) Draw a layout of typical hydroelectric plant. Explain different components of hydroelectric plant. **07**
- Q.3** (a) Define displacement thickness. Derive an expression for the displacement thickness. **07**
- (b) Draw the neat sketch of the Pelton turbine. Discuss briefly the function of its main components. **07**
- OR**
- Q.3** (a) Write short note on separation of boundary layer. **07**
- (b) What are the general requirements of a ventilation system? Differentiate between natural and mechanical ventilation system. **07**
- Q.4** (a) Draw specific energy diagram. Derive an expression for critical depth and critical velocity. **07**
- (b) Prove that the maximum velocity in a circular pipe for viscous flow is equal to two times the average velocity of the flow. **07**
- OR**
- Q.4** (a) Explain the term hydraulic jump. Derive an expression for the depth of hydraulic jump in terms of the upstream Froude number. **07**
- (b) Derive an expression for velocity distribution for turbulent flow in (a) smooth pipes (b) rough pipes. **07**
- Q.5** (a) Explain the Buckingham π theorem for dimensional analysis. **07**
- (b) In 1: 30 model of a spillway, the velocity and discharge are 1.5 m/sec and 2 m³/sec. Find the corresponding velocity and discharge in prototype. **07**
- OR**
- Q.5** (a) Explain distorted and undistorted models with advantages and disadvantages. **07**
- (b) The pressure difference ΔP in a pipe of diameter D and length L due to turbulent flow depends on the velocity V , viscosity μ , density ρ and roughness k . Express ΔP in terms of dimensionless parameters. **07**
