

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI(OLD) – EXAMINATION – SUMMER 2019

Subject Code:160602

Date:29/05/2019

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) Define specific energy. Explain specific energy diagram with its applications. **07**
(b) State and prove Buckingham's π theorem. How repeating variables are selected in dimension analysis. **07**

- Q.2** (a) Prove that maximum velocity is 1.5 times the average velocity of the flow for viscous flow between two parallel fixed plates. **07**
(b) Derive equation of boundary layer thickness and coefficient of drag in term of Reynolds's number. **07**

OR

- (b) What are different types of characteristic curves of a hydraulic turbine? How they are obtained and useful to engineer? **07**

- Q.3** (a) The ratio of lengths of submarine and its model is 25:1. Speed of prototype is 15m/sec. If model to be tested in wind tunnel, find speed of model. Also determine ratio of drag force between model and its prototype, if kinematic viscosity for sea water and air as 0.014 stokes & 0.018 stokes respectively. Take density of sea water and air as 980 kg/m³ and 1.35 kg/m³ respectively. If resistance force offered by a model is 75 N. Find resistance experience by submarine. **07**
(b) What is water hammer effect? Derive equation for pressure growth due to gradual and sudden closure of valve in a rigid pipe. **07**

OR

- Q.3** (a) Describe Von Karman momentum integral equation. **07**
(b) Discuss shear stress in a turbulent flow. Also explain hydro dynamically smooth and rough boundaries. **07**

- Q.4** (a) A trapezoidal channel section having a longitudinal slope of 1 in 2100 with side slope of 1:1.5. Calculate bed width and depth of flow if channel design for a discharge of 130 cumec with depth of flow 0.7 times its width. Take Manning's coefficient as 0.019. **07**
(b) Explain various dimensionless numbers. What are its applications in dimension analysis? **07**

OR

- Q.4** (a) Derive condition for maximum velocity and maximum discharge in case of the most economical circular channel section. **07**
(b) Define and classify ventilation system. Describe requirements of good ventilation systems. **07**

- Q.5** (a) A Pelton wheel turbine is to be designed for a head of 75 m, when running at 225 rpm. The Pelton wheel develops a 120 KW shaft power. The bucket velocity is 0.45 times velocity of a jet. Take overall efficiency as 85% and coefficient of velocity is equal to 0.98. **07**
(b) State applications of Froude's model law. Also find scale ratio for various physical quantities based on Froude's model law. **07**

OR

- Q.5** (a) Explain cavitations in turbine and centrifugal pump. Also give its effects and precautions against cavitations. **07**
- (b) Discuss separation of boundary layers. Which methods are preventing separation of boundary layer? **07**
