1

**GUJARAT TECHNOLOGICAL UNIVERSITY** 

**BE - SEMESTER-VI- EXAMINATION - SUMMER 2016** Date:21/05/2016

Subject Code:160602

Subject Name: Applied Fluid Mechanics

Time: 10:30 AM to 01:00 PM

**Instructions:** 

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- 0.1 Draw a typical specific energy diagram for the open channel flow and explain 07 (a) it. Also define critical velocity. 07
  - Explain importance of Reynold's experiment with neat sketch. **(b)**
- (a) Explain working of a centrifugal pump. Q.2
  - (b) Draw a schematic diagram of hydroelectric power plant (HEPP). Explain main 07 elements of HEPP.

OR

- For a laminar flow of an oil having dynamic viscosity  $\mu$ =1.766 Pa.s in a 0.3 07 **(b)** metre diameter pipe the distribution is parabolic with a maximum point velocity 3 m/s at the centre of the pipe. Calculate the shear stress at 60 and 90 mm from the pipe wall.
- Q.3 **(a)** Derive expressions for Euler's equation of motion. 07
  - (b) List out different methods for viscosity measurement. Explain capillary tube 07 viscometer.

OR

- 0.3 (a) Explain Prandtl mixing length theory and define mixing length clearly. 07 Calculate the resistance forces on a moving plate of size  $1.5 \text{ m} \times 1.5 \text{ m}$  in water 07 **(b)** and air. The plate moves at a velocity of 9.5 m/s normal to its plane. Densities
  - of water and air are 1000 kg/m<sup>3</sup> and 1.2 kg/m<sup>3</sup> respectively. Take  $C_D = 0.75$  for both cases.
- Define: (1) Turbulent boundary layer, (2) Momentum thickness, (3) Energy **Q.4 (a)** 07 thickness, (4) Laminar boundary layer.
  - (b) Explain drag on a circular cylinder.

## OR

- Q.4 **(a)** Determine dimensions of (1) Velocity, (2) Force, (3) Discharge, (4) Dynamic 07 viscosity, (5) Specific weight, (6) Shear stress, (7) Angular velocity and acceleration.
  - (a) Classify different types of hydraulic jumps. 07 **(b)** (b) A rectangular channel carries a discharge of 20  $\text{m}^3/\text{s}$  at a depth of 1 m. The width of channel is 5 m. If a hydraulic jump forms on downstream side, calculate the depth of flow after jump.
- What is priming? Why it is necessary. Q.5 07 **(a)** Explain undistorted and distorted models with advantages and disadvantages. 07 **(b)** OR
- Explain propulsion type of mechanical ventilation system with advantage and 07 Q.5 (a) disadvantages.
  - The resisting torque T against the motion of a shaft in a lubricated bearing **(b)** 07 depends on the viscosity  $\mu$ , rotational speed N, diameter D and the bearing Buckingham's pressure intensity By using  $\pi$ -theorem p. show

## **Total Marks: 70**

07

07

Enrolment No.

that  $T = \mu N D^3 \phi \left(\frac{p}{\mu N}\right)$ .

\*\*\*\*\*