

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI • EXAMINATION – SUMMER 2013****Subject Code: 160602****Date: 27-05-2013****Subject Name: Applied 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) Explain Euler's equation of motion for three dimensional flow state its applications. **07**
(b) Two horizontal plates are 100 mm apart. An oil of viscosity 1.5 Ns/m^2 flows between the plates, the maximum velocity being 2 m/s. Find (i) Discharge per meter width (ii) Velocity at 25 mm from a plate (iii) Velocity gradient at the plate and (iv) Shear stress at the plate. **07**

- Q.2** (a) Define Laminar boundary layer, Turbulent boundary layer, Laminar sub layer, Displacement thickness, Energy thickness, Local co-efficient of drag, Average co-efficient of drag **07**
(b) A plate 1 m x 1 m moves through air of density 1.15 kg/cum at 36 km/hour. Determine (i) The drag force, (ii) The lift force, (iii) The resultant force, and (iv) The power required to maintain the plate in motion. Take $C_d = 0.18$, $C_l = 0.70$ **07**

OR

- (b) Obtain Von Karman momentum integral equation. **07**
- Q.3** (a) Derive the equation of gradually varied flow and clearly state the assumption made in it. **07**
(b) A 6 m wide channel conveys water at a depth of 2.15 m. The bed slope of the channel is 0.001. Find the width to be provided in the transition so as to obtain critical depth. Alternatively, with the same width of 6 m, find the rise in bed level required to produce critical flow in the channel. Take Manning's coefficient $N = 0.018$. **07**

OR

- Q.3** (a) Discuss the specific energy curve with sketch. **07**
(b) A standing wave flume is provided in a rectangular channel 2.50 meter wide, the throat width being 1.25 meter. Calculate the discharge and the upstream depth when the depth at the throat is 0.60 meter. **07**

- Q.4** (a) Explain difference between Impulse and Reaction turbine. **07**
(b) Define characteristic curve. Explain main characteristic curves with figure. **07**

OR

- Q.4** (a) Derive an equation of specific speed of centrifugal pump. **07**
(b) A pelton wheel of 1.2 m mean bucket diameter works under a head of 650m water is deflected through an angle of 165° by moving bucket. Friction reduces the relative velocity by 15% on bucket. The water leaves the bucket without whirl. Calculate (1) Rotational speed of the wheel (2) Ratio of bucket speed to jet velocity (3) Power developed by the wheel. (4) Available power and the power input to bucket. (5) Hydraulic efficiency of wheel. Take $C_v = 0.97$ **07**

- Q.5 (a)** What is meant by dimensional analysis? What are its limitations and advantages? **07**
- (b)** A geometrically similar model of an air duct is built to 1/25 scale and tested with water which is 50 times more viscous and 800 times denser than air. When tested under dynamically similar conditions, the pressure drop is 2 kg/cm² in the model. Find the corresponding pressure drop in the full scale prototype and express in cm of water. **07**

OR

- Q.5 (a)** Explain Buckingham theorem method, **07**
- (b)** Explain the forces acting in moving fluid. **07**
