

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- IVth SEMESTER-EXAMINATION – MAY/JUNE- 2012****Subject code: 143403****Date: 29/05/2012****Subject Name: Fluid Mechanics and Machinery****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) Define surface tension. Explain Surface tension on Liquid Droplet and Liquid Jet. **07**
(b) Explain Buckingham's Π -theorem. How are the repeating variables selected for dimensional analysis? **07**
- Q.2** (a) Explain the terms: (i) Kinematic and Dynamic viscosity and (iii) Newton's Law of viscosity **07**
(b) Define capillarity. Obtain an expression for capillarity rise of a liquid. **07**
- OR**
- (b) What do you understand by the terms: Major energy loss and minor energy losses in pipes? **07**
- Q.3** (a) Derive Euler's equation of motion. How will you obtain Bernoulli's equation from it? **07**
(b) The diameters of a pipe at the sections 1 and 2 are 10 cm and 15 cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5 m/s. Determine also velocity at section 2. **07**
- OR**
- Q.3** (a) A main pipe divides into two parallel pipes which again forms one pipe. The length and diameter for first parallel pipe are 2000 m and 1.0 m respectively, while the length and diameter for second parallel pipe are 2000 m and 0.8 m. Find the rate of flow in each parallel pipe, if total flow in the main is $3.0 \text{ m}^3/\text{s}$. The co-efficient of friction for each parallel pipe is same and equal to 0.005. **07**
(b) Explain Laminar boundary layer, turbulent boundary layer and boundary layer thickness. **07**
- Q.4** (a) Define Similitude. Explain three types of similarities. **07**
(b) Define Dimensionless numbers. Explain any three Dimensionless numbers. **07**
- OR**
- Q.4** (a) A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 700 litres/s under a head of 30 m. The buckets deflect the jet through an angle of 160° . Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.98. **07**
(b) Explain main parts of a Radial Flow reaction turbine. **07**
- Q.5** (a) Explain working principle of Kaplan turbine. **07**
(b) A centrifugal pump is to discharge $0.118 \text{ m}^3/\text{s}$ at a speed of 1450 r.p.m. against a head of 25m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. **07**
- OR**
- Q.5** (a) Explain working principle of Rotary pump. **07**
(b) Define Indicator diagram. How will you prove that area of indicator diagram is proportional to the work done by the reciprocating pump? **07**
