Seat No.: _____ Enrolment No._____

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 m^3/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 0.118m^3/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**

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