Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) - EXAMINATION – SUMMER 2016

Subject Code:2152003 **Date:06/05/2016**

Subject Name:Fluid Mechanics & Machines

Time:02:30 PM to 05:00 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 terms: **07**

1) Density
2) Viscosity
3) Cavitation
4) Surface Tension
5) Specific Volume
6) Specific Gravity
7) Newton's Law of Viscosity

(b) A Circular plate 3.0 m diameter is immersed in water in such a way that its greatest and least depth below the free surface is 4 m and 1.5 m respectively. Determine the total pressure on one face of the plate and position of the centre of pressure. **07**

Q.2 **(a)** (i) State and prove Pascal's Law. **04**

(ii) Find out the minimum size of glass tube that can be used to measure water level if the capillary rise in the tube is to be restricted to 2mm consider surface tension of water in contact with air as 0.073575 N/m. **03**

(Density of Water=1000 kg/m^3)

(b) Describe the types of fluid flow. Explain Stream-lines, Path-lines and Streak-lines. **07**

OR

(b) What is Continuity Equation? Derive Continuity Equation for three dimensions. **07**

Q.3 **(a)** State and derive Bernoulli's theorem, state its application and assumptions made. **07**

(b) Explain the condition of stability for a submerged and floating body with neat diagrams. **07**

OR

Q.3 **(a)** 1) Explain boundary layer theory. **03**

2) State and derive moment of momentum equation. **04**

(b) Derive the expression for the loss of head due to friction in pipes. **07**

Q.4 **(a)** (1) Derive an expression for head loss when the flow is passing through Sudden contraction of pipe. **04**

(2) What do you understand by laminar flow and turbulent flow? **03**

(b) A centrifugal pump is to discharge 0.118 m^3/s at a speed of 1450 r.p.m. against a head of 25 m. 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.4 **(a)** What is Meta-Center? Derive equation for Meta-Centric height of floating body. **07**

(b) 1) What is the function of air vessels in Reciprocating pump. **04**

2) Compare multi stage pumps in series with pumps in parallel. **03**

Q.5	**(a)**	Define a centrifugal pump. Explain the working of a single-stage centrifugal pump with sketches.	**07**
	(b)	A Pelton wheel is to be designed for the following specifications: Shaft power = 11,772 kW, Head = 380 m, Speed = 750 r.p.m., Overall efficiency = 86%, Jet diameter is not to exceed one-sixth of the wheel diameter. Determine: (i) The wheel diameter, (ii) The number of jets required, and (iii) Diameter of the jet. Take K_{v1}= 0.985 and K_{u1}= 0.45	**07**

OR

Q.5	**(a)**	What is a reciprocating pump? Explain the working of a reciprocating pump with neat sketch.	**07**
	(b)	(1) Give differences between Francis turbine and Kaplan turbine.	**04**
		(2) What is Draft-Tube? Give types of Draft-Tubes.	**03**

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