Seat No.:

Enrolment No.\_\_\_\_\_

## GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-V EXAMINATION – WINTER 2015

Subject Code: 152003Date:08/12/201			
Su Tii Inst	bject ne: 1 tructio 1. 2. 3.	Name: Fluid Mechanics and Machines0:30am to 1:00pmTotal Marks: 70ons: Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.	
Q.1	(a)	State and prove the pascal's law and give some examples where this principle is applied.	07
	(b)	Derive the expression for total pressure and Centre of pressure for a vertical plate, submerged in the liquid with usual notations	07
Q.2	(a)	State and explain the Newton's law of viscosity. Density of liquid is $850 \text{ kg/m}^3$ Determine relative density and weight density of the fluid with reason, state whether the liquid will float on water or not.	07
	(b)	The space between two square flat parallel plate is filled with oil. Each side of the plate is 720 mm. The thickness of the oil film is 15 mm. The upper plate, which moves at 3 m/s requires a force of 120 N to maintain the speed. Determine (i) The dynamic viscosity of the oil; (ii) The kinematic viscosity of oil if the specific gravity of oil is 0.95	07
	(b)	Define and distinguish between following fluid properties (i) Dynamic Viscosity and Kinematic viscosity (ii) Cohesion and Adhesion (iii) Surface tension and Capillarity	07
Q.3	(a) (b)	Derive Darcy-Weisbach equation. Give differences between following flows (i) Steady and Unsteady flow. (ii)Uniform and non-uniform flow (iii) Laminar and Turbulent flow.	07 07
		OR	
Q.3	(a)	State similarity laws. Where are they used? Explain Froude, Euler and Weber model law with applications.	07
	(b)	A U – tube is made of two capillaries of bores 1.2 mm and 2.4 mm respectively. The tube is held vertical and partially filled with liquid of surface tension 0.06 N/m and zero contact angle. If the estimated difference in the level of two menisci is 15 mm, Determine the mass density of liquid.	07
Q.4	(a)	<ul><li>(i) Differentiate clearly between Impulse turbine and Reaction turbine.</li><li>(ii) Explain function of components of Pelton turbine.</li></ul>	03 04
	(b)	Determine the overall efficiency of a Kaplan turbine developing 2850 kw under a head of 5.2 m. It is provided with a draft tube with its inlet (diameter 3m)set 1.8 m above the tail race level. A vacuum gauge connected to the draft tube indicates a reading of 5.2 m of water. Assume draft tube efficiency as 75 percent.	07
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Q.4 (a) Explain the term 'Minor losses'. Obtain an equation to calculate head loss due to 07 sudden expansion and from that equation derive equation of exit loss.

- (b) It is required to deliver 0.048 m<sup>3</sup>/s of water to a height of 24 m through a 150 mm diameter pipe and 120 m long, by a centrifugal pump. If the overall efficiency of the pump is 75 % and co efficient of friction, f = 0.01 for the pipe line, find the power required to drive the pump.
- Q.5 (a) Sketch a hydro-power plant and explain its different elements. 07
  - (b) Explain the total energy gradient line and the hydraulic gradient line for fluid 07 flow through a piping system

## OR

- Q.5 (a) Explain following terms: Net positive suction head, Priming, Cavitation in pump 07
  - (b) Define the term unit speed, unit discharge, unit power and specific speed as used in connection with the operation of a hydraulic machine.

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