Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEMESTER–VI • EXAMINATION – SUMMER 2015

Subject Code: 160602 **Date:04/05/2015**

Subject Name: APPLIED FLUID MECHANICS

Time:10.30AM-01.00PM **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)**	Obtain the Hagen-Poiseuille equation for viscous flow through a circular pipe.	**07**
	(b)	Explain boundary layer growth over a flat plate. Also explain causes of flow separation from a solid boundary.	**07**
Q.2	**(a)**	Calculate (i) the discharge per meter width (ii) pressure difference between two points 5 m apart and (iii) velocity gradient and (iv) velocity at 2 mm from plate for oil of viscosity 18 poise flowing between two parallel plates kept 10mm apart, consider that the maximum velocity at the centre of plate = 1.8 m/s.	**07**
	(b)	Draw the specific energy curve for constant discharge in an open channel. Explain the terms critical flow, sub critical and supercritical flow in terms of Froude number.	**07**
		OR	
	(b)	Calculate the displacement thickness, momentum thickness and energy thickness for the velocity distribution $\frac{u}{V} = \frac{y}{\delta}$ for a flat plate boundary.	**07**
Q.3	**(a)**	Explain the drag and lift force component on a submerged object. What do you understand by Magnus effect?	**07**
	(b)	Water flows in a rectangular channel having Manning roughness coefficient n = 0.017. The channel slope is 1 in 7000. If the bottom width is 5 m and depth of flow is 1.1 m, calculate the discharge in the channel. Also calculate the specific energy and critical depth.	**07**
		OR	
Q.3	**(a)**	What is a hydraulic jump? Discuss the various types of jump based on Froude number.	**07**
	(b)	Draw a neat sketch showing the elements of a hydroelectric plant. Discuss the components of Pelton turbine in detail.	**07**
Q.4	**(a)**	A Pelton turbine develops 2500kW under a head of 200 m. Considering a speed ratio of 0.43, coefficient of velocity = 0.97 and specific speed of 17, calculate (i) the diameter of Pelton wheel and (ii) jet diameter. Take overall efficiency = 85%.	**07**
	(b)	What is the function of a draft tube? Also sketch the different type of draft tubes.	**07**
		OR	
Q.4	**(a)**	What is a backwater curve? Calculate the length of backwater curve considering that the depth increases from 3 m to 5 m in a river having width of 85m. The roughness coefficient may be taken as 0.035 and channel bottom slope of 1 in 3000.	**07**
	(b)	Discuss the terms specific speed, unit speed, unit discharge and unit power for a turbine.	**07**
Q.5	**(a)**	What are the general requirements of a ventilation system? Differentiate	**07**

between natural and mechanical ventilation system.

(b) Explain the Buckingham's π- theorem in dimensional analysis. **07**

OR

Q.5 **(a)** Explain the terms geometric similarity, kinematic similarity and dynamic similarity for physical models. **07**

(b) What do you understand by cavitation of a hydraulic machine? How can we prevent cavitation of hydraulic machines? **07**

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