Seat No.: ________ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI (Old) EXAMINATION – WINTER 2019

Subject Code: 160602 **Date: 16/12/2019**

Subject Name: Applied Fluid Mechanics

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)**	Derive an equation in form of friction factor is used to find loss of head due to friction in pipes.	**07**
	(b)	Define Model. Why model study is necessary? Explain Reynolds model law in detail.	**07**
Q.2	**(a)**	Classify turbines based on direction of flow of water through runner. Also explain main parts of reaction turbine.	**07**
	(b)	Explain graphically longitudinal variation in total head & the piezometric head at salient points of pipe line.	**07**
		OR	
	(b)	A trapezoidal channel section has been laid at a longitudinal slope of 1 in 1750 with side slope of 1.5 horizontal to 1 vertical. Calculate bed width & depth of flow if it carries a discharge of 120 cumecs with depth of flow is 0.7 times its width. Take Manning's coefficient as 0.014.	**07**
Q.3	**(a)**	Derive equation of total head loss for compound pipe. How one can determine equivalent size of a compound pipe?	**07**
	(b)	Find displacement thickness, momentum thickness and shape factor for the velocity distribution in boundary layer given by $$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y^2}{\delta^2}\right)$$	**07**
		OR	
Q.3	**(a)**	A pipe of diameter 40 cm and length of 2500 m is used for transmission of power by water. The total head at the inlet of pipe is 500 m. Find maximum power available at outlet of pipe. Take f = 0.006.	**07**
	(b)	Discuss phenomenon of boundary layer separation. Also explain methods of preventing separation of boundary layer.	**07**
Q.4	**(a)**	State assumptions made in derivation of dynamic equation of GVF. Also derive differential equation of gradually varied flow.	**07**
	(b)	Derive expression for specific speed of turbine. What is its significance?	**07**
		OR	
Q.4	**(a)**	The depth of flow of water at a certain location of a rectangular channel of 2 m wide is 0.5 m. The discharge through channel is 1.5 cumec. Determine whether a hydraulic jump will occur and if so, find its height & loss of energy per kg of water.	**07**
	(b)	Why pumps are connected in series and in parallel? Write a brief note on multistage pump.	**07**
Q.5	**(a)**	For most economical circular channel section derive condition for maximum velocity & maximum discharge.	**07**

(b) State Buckingham's π theorem. Also obtain an expression for lift force (F_L) on air foil depends upon mass density (ρ) of medium, velocity of flow (V), characteristics length (d), viscosity (μ) and angle of attach (α). **07**

OR

Q.5 **(a)** Draw specific energy curve. Give application of specific energy diagram when channel with a hump and incoming flow is sub critical. **07**

(b) What do you mean by cavitations? Also explain cavitations in centrifugal pumps with its precautionary measures. **07**

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