Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2160602 Date:14/05/2019

Subject Name:Applied Fluid Mechanics

Time:10:30 AM TO 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.**

			MARKS
Q.1	**(a)**	Explain the terms: Hydraulic gradient line and Total energy line.	**03**
	(b)	Derive an expression for the loss of head due to sudden enlargement of a pipe.	**04**
	(c)	Prove that the velocity distribution for viscous flow between two parallel plates when both plates are fixed across a section is parabolic in nature.	**07**
Q.2	**(a)**	Explain the terms: Pipes in parallel and Equivalent pipe.	**03**
	(b)	Derive an expression for the loss of head due to friction in pipe.	**04**
	(c)	Explain the term hydraulic jump. Derive an expression for the depth of hydraulic jump in terms of the upstream Froude number.	**07**
		OR	
	(c)	Draw specific energy curve. Also derive expressions for critical depth and critical velocity.	**07**
Q.3	**(a)**	Explain laminar boundary layer.	**03**
	(b)	Derive an expression for the momentum thickness (θ) of boundary layer flow.	**04**
	(c)	Explain Froude model law. Obtain scale ratio for time, acceleration and discharge for the Froude model law.	**07**
		OR	
Q.3	**(a)**	Define: Inertia force, Viscous force and Gravity force.	**03**
	(b)	Explain the Buckingham's π-theorem in dimensional analysis.	**04**
	(c)	Explain boundary layer separation. Also discuss the effect of pressure gradient on boundary layer separation.	**07**
Q.4	**(a)**	What is priming? Why it is necessary.	**03**
	(b)	Draw a layout of hydroelectric plant and explain different components of hydroelectric plant.	**04**
	(c)	A Francis turbine of 1.2 metre runner diameter working under a head of 5 metres at a speed of 200 rpm develops 70 kW when the rate of flow of water is 2 m^3 /s. If the head on the turbine is increased to 17 metre, determine the new speed, discharge and power.	**07**
		OR	
Q.4	**(a)**	Explain the efficiencies of turbine.	**03**
	(b)	Explain the principal and working of a centrifugal pump with a neat sketch.	**04**
	(c)	A centrifugal pump delivers water against a net head of 15 m and a design speed of 1000 rpm. The vanes are curved back to an angle of 30° with the periphery. The impeller diameter is 250 mm and outlet width 50 mm. determine the discharge of the pump if manometric efficiency is 95%.	**07**
Q.5	**(a)**	Explain the terms: affux, back water curve, unsteady flow.	**03**

(b) Differentiate between: (1) uniform flow and non-uniform flow (2) laminar flow and turbulent flow **04**

(c) A trapezoidal channel has side slopes of 3 horizontal to 4 vertical and slope of its bed is 1 in 2000. Determine the optimum dimensions of the channel if it is to carry water at 0.7 m^3/s. Take Chezy's constant as 60. **07**

OR

Q.5 **(a)** Explain the terms: open channel flow, steady flow, critical flow. **03**

(b) Show that for trapezoidal channel of most economical section (1) half of top width = length of one of the slopping side (2) hydraulic mean depth = $\frac{1}{2}$ depth of flow. **04**

(c) The discharge of water through a rectangular channel of width 7.5 m is 20 m^3/s when depth of flow of water is 1.5 m. Calculate: (1) specific energy of the flowing water (2) critical depth and critical velocity (3) value of minimum specific energy. **07**

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