GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) EXAMINATION - WINTER 2017

Subject Code: 2160602 Date:08/11/2017

Subject Name: Applied Fluid Mechanics

Time:02:30 PM TO 05:00PM 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)	Define: (i) Critical depth (ii) Total energy line (iii) Hydraulic gradient line.	03				
	(b)	Write a brief note on major and minor losses in pipes.	04				
	(c)	Derive the Darcy-Weisbach equation for calculating head loss due to friction.	07				
Q.2	(a)	Describe water hammer phenomenon in pipes.	03				
	(b)	Prove that for the most economic section of a trapezoidal channel is: "half of the top width is equal to one of the sloping sides".	04				
	(c)	Derive the Hagen-Poiseuille equation and state the assumptions made.	07				
	(c)	OR A trapezoidal channel with base width 5 m is used to carry a discharge of 30 cumec. The channel has side slopes: 2 horizontal to 1 vertical. If the depth of flow is 1.5 m, determine the Froude number and comment whether the flow is subcritical / critical / super critical flow.	07				
Q.3	(a)	Explain hydraulically smooth and rough pipes.	03				
	(b) (c)	Discuss the classification of open channel flow with examples. What is specific energy? Draw a typical specific energy curve and discuss critical depth and alternate depths.	04 07				
	OR						
Q.3	(a) (b)	Explain briefly Prandtl's mixing layer theory. Define boundary layer, laminar sub-layer, displacement thickness and momentum thickness.	03 04				

(c)	A pipe system consists of three pipes arranged in s	series.

Sr. No	Pipe	Length (m)	Diameter (cm)
1.	AB	1000	40
2.	BC	2500	30
3.	CD	3000	20

Transform the system to (i) an equivalent length of 30 cm diameter pipe, and (ii) an equivalent diameter for the pipe 6500 m long.

- Q.4 (a) What is a hydraulic jump? Discuss the types of jump based on Froude number.
 - (b) Derive an equation of specific speed of centrifugal pump. 04
 - (c) Explain the occurrence and shape of different surface water profiles 07

07

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Q.4	(a) (b)	Differentiate impulse turbine and reaction turbine with examples. Discuss briefly various similarities between the model and the prototype.	03 04
	(c)	State and explain Buckingham's Pi-Theorem	07
Q.5	(a)	What is a draft tube. Discuss its functions.	03
	(b)	What is meant by distorted and undistorted models? What are the merits and demerits of using distorted models?	04
	(c)	Derive the equation for gradually varied flow. Discuss the assumptions made for the derivation.	07
		OR	
Q.5	(a)	Explain cavitation in Turbines and pumps.	03
	(b)	A Francis Turbine is proposed to be installed at an available head of 60m and a discharge of 40 m ³ /s. Determine the number of turbines and power available if the specific speed is 210 and these are to run at 540 rpm with an overall efficiency of 85%.	04
	(c)	Explain laminar and turbulent boundary layer over a thin flat plate with a suitable sketch.	07
