Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

		M. E SEMESTER – I • EXAMINATION – WINTER • 2014	
Subject code: 2713303 Date: 09-01-24			
Su	bject	Name: Advanced Fluid Mechanics	
Ti	me: 02	2:30 pm - 05:00 pm Total Marks: 70	
Ins	struct	ions:	
	1. 2. 3.	Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.	
Q.1	4. (a)	Explain briefly the classification of open channel flows. Also give examples of each type of flow.	07
	(b)	Explain Prandtløs mixing length theory.	07
Q.2	(a)	Describe Navier-Stockø equation and its applicability in fluid flow problems.	07
	(b)	For generalized Couette flow, show that the discharge per unit width is given by $q = U \frac{h}{2} - \frac{h^3}{12\mu} \frac{dp}{dx}$.	07
		OR	
	(b)	Calculate the friction drag on a flat plate 15 cm wide and 45 cm long placed longitudinally in a stream of oil of relative density 0.925 and 0.9 stoke, flowing with a free stream velocity of 6.0 m/s. Also, find the thickness of the boundary layer and shear stress at the trailing edge.	07
Q.3	(a)	 Sketch the possible GVF profiles in the following serial arrangement of channels (i) Steep ó Steeper óMild ó Milder slope (ii) Steep ó Horizontal ó Mild slop (iii) Mild ó Sluice gate ó Steep ó Horizontal ó Sudden drop 	07
	(b)	Write assumption in GVF and develop the gradually varied flow equation for wide rectangular channel $\frac{dy}{dx} = S_0 \left(1 - \left(\frac{y_0}{y}\right)^{\frac{10}{3}} \right) / \left(1 - \left(\frac{y_c}{y}\right)^3 \right)$ where the terms	07
		have their usual meaning.	
		OR	
Q.3	(a) (b)	Explain control sections and give examples of controls in GVF with sketches. A stationary hydraulic jump occurs in a rectangular channel with the initial and sequent depths being equal to 0.20m and 1.20 m respectively. Estimate (i) discharge per unit width and (ii) the energy loss.	07 07
Q.4	(a) (b)	Explain briefly classification of flow profiles with sketches. A wide rectangular channel ($n = 0.015$) carries a flow of 2.5 m ³ /s per meter	07 07

- (b) A wide rectangular channel (n = 0.015) carries a flow of 2.5 m³/s per meter width. The bed slope of the channel is 0.005. Determine whether the channel slope is mild, steep or critical.
 OR
- Q.4 (a) Explain method of characteristics.

07

	(b)	Derive differential equation of SVF with increasing discharge.	07
Q.5	(a)	Write a short note on hydraulically smooth and rough pipes.	07
	(b)	In a rough pipe of diameter 0.6 m and length 4500 m water is flowing at the rate of 0.6 m^3 /s. if the average height of roughness is 0.48 mm find the power required to maintain the flow.	07
05	(a)	UR Enlist the various methods of determining the coóefficient of viscosity of a	07
Q. 3	(<i>a</i>)	liquid and describe any one method in detail.	07
	(b)	Explain the separation of boundary layer, its effect on moving bodies and control measures to be taken for it.	07
