Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – WINTER • 2014

Subject Code: 160602 **Date: 28-11-2014**

Subject Name: Applied Fluid Mechanics

Time: 02:30 pm - 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)**	Explain Reynolds and Froude Model law. Based on the two model laws obtain the scale ratios for length, velocity and time.	**07**
	(b)	A model of open channel is fabricated to simulate flow in prototype in the turbulent flow range for rigid bed conditions Find the value of Manning's n for model if the value for n for proto type is 0.013 . The length scale ratio is 1:60	**07**
Q.2	**(a)**	State and discuss the assumptions made in the derivation of the dynamic equation for gradually varied flow	**07**
	(b)	The normal depth of flow flow in a rectangular channel 1.5 metre wide is 1 metre .The bed slope of channel is 0.00006. Manning's n is 0.012 . Find the critical depth. At two sections of the same channel the depths are 0.92 and 0.86 metre respectively. Find which of the two sections is upstream.	**07**
		OR	
	(b)	An oil of viscosity 1 poise and specific gravity 0.85 is flowing through a circular pipe of diameter 10 cm at the rate of 6 liters/second. Calculate (i) pressure drop in length of 500 metre (ii) Shear stress at 4 cm from the centre.	**07**
Q.3	**(a)**	Explain distorted and undistorted models and give reasons for using distorted models	**07**
	(b)	State the procedure for locating hydraulic jump below a sluice in a mild sloped channel.	**07**
		OR	
Q.3	**(a)**	Define impulse and reaction turbines. Give the significance of specific quantities and unit quantities.	**07**
	(b)	Draw sketches to explain the operating characteristics of centrifugal pump	**07**
Q.4	**(a)**	Discuss the development of boundary layer over a flat plate explaining laminar and turbulent boundary layer and establishment length.	**07**
	(b)	Draw M_1, M_2 and M_3 type surface profiles using basic equations of gradually varied flow. Give examples of their occurrence	**07**
		OR	
Q.4	**(a)**	(i) Develop the expression for average shear stress for a steady uniform flow in open channel in terms of hydraulic radius and channel bottom slope (ii) Give the significance of hydraulic radius and hydraulic mean depth.	**07**
Q.4	**(b)**	State the disadvantage of separation in fluid flow and explain how separation of flow can be controlled by(i) acceleration of flow in the boundary layer (ii) suction of flow from the boundary layer.	**07**

Q.5	**(a)**	(i) Draw proportionate sketches to show the velocity distribution and the shear stress distribution for steady viscous flow for the following cases : pipes, parallel plates both plates at rest, parallel plates one plate moving with velocity "v". State the nature of variation. (ii) Explain adverse pressure gradient in Coutte flow and its effect on velocity distribution	**08**
	(b)	A liquid flows through a circular pipe resulting pressure drop of 2 KPa in a pipeline of length 10 metre. Find the pressure drop if flow rate is doubled. Assume flow as steady and viscous.	**06**

OR

Q.5	**(a)**	Explain direct step method for finding out length of gradually varied surface profile	**07**
	(b)	(i) A rectangular channel is 4 metre wide and admits discharge of 16 m^3 /s Find if hydraulic jump can be expected at an initial depth of 0.6 m (ii) Discuss the utility of hydraulic jump and examples of its occurrence	**07**

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