Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – WINTER 2013

Subject Code: 160602 **Date: 29-11-2013**

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)**	Draw sketches to explain the development of boundary layer along a flat plate. Enlist the factors affecting establishment length	**07**
	(b)	Explain the displacement and the momentum thickness	**07**
Q.2	**(a)**	Explain the separation of boundary layer and ill effects and explain how it can be controlled	**07**
	(b)	Write the governing equation for drawing the gradually varied flow profiles. With the help of this equation draw M_1, M_2 and M_3 type of profiles and give examples where they occur in reality.	**07**
		OR	
	(b)	Write the procedure for locating the hydraulic jump below a sluice gate on a mild slope which exists on the down stream side for a long reach of the channel.	**07**
Q.3	**(a)**	For a laminar flow of an oil having dynamic viscosity $\mu = 1.766$ Pa.s in a 0.3 metre diameter pipe the velocity distribution is parabolic with a maximum point velocity 3m/s at the centre of the pipe. Calculate the shear stress at 60 and 90 mm from the pipe wall.	**07**
	(b)	Give the use of dimensional analysis in presenting experimental data and in model investigation.	**07**
		OR	
Q.3	**(a)**	A smooth wrought iron pipe 0.2 metre in diameter carries crude oil at a velocity of 2.5m/s . Find the loss of head per 100 metre and the power required to maintain the flow Take kinematic viscosity as 0.4 stokes and specific gravity as 0.90.	**07**
	(b)	Give the merits and limitations of distorted models.	**07**
Q.4	**(a)**	Derive the expression for Reynolds shear stress in a turbulent flow field by use of Prandtl mixing length theory and state its utility.	**07**
	(b)	Define lift and drag. Enlist and explain the parameters on which the lift and drag forces will depend for a body placed in a flow field	**07**
		OR	
Q.4	**(a)**	By the use method of dimensional analysis obtain an expression for critical depth y_c in a triangular channel, the critical depth depends upon discharge Q, acceleration due to gravity and angle of channel θ	**07**
	(b)	Give the significance of specific speed and unit speed of turbine. Define and give examples of impulse and reaction turbines.	**07**
Q.5	**(a)**	Distinguish between rapidly varied and gradually varied flow, steady uniform and unsteady uniform flow. Give examples of each.	**07**

(b) Air flows over a plate 1metre long at velocity of 6m/s Determine the total drag per unit length on the sides of the plates. Take mass density of air as 1.226 kg/m^3 and kinematic viscosity as 0.15x 10^{-4} m^2/s **07**

OR

Q.5 **(a)** Discuss the variation of velocity along a vertical for turbulent flow in a rigid bed open channel **07**

(b) A Francis turbine of 1 metre runner diameter working under a head of 5 metres at a speed of 205 rpm develops 75 kW when the rate of flow of water is 1.8 m^3 /s . If the head on the turbine is increased to 15 metre determine the new speed ,discharge and power. **07**

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