GUJARAT TECHNOLOGICAL UNIVERSITY
BE- VIth SEMESTER–EXAMINATION – MAY- 2012

Subject code: 160602   **Date: 11/05/2012**
Subject Name: Applied Fluid Mechanics
Time: 10:30 am – 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.**

Q.1 **(a)** Derive an expression for the velocity distribution of viscous flow through a circular pipe and prove that the ration of maximum velocity to average velocity is 2. **07**

(b) A fluid of viscosity 0.98 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 100mm and of length 12m. Calculate the difference of pressure at the two ends of the pipe, if 120 kg of fluid is collected in a tank in 30 seconds. **07**

Q.2 **(a)** Derive an expression for the momentum thickness(θ) and energy thickness(δ^{**}) of boundary layer flow. **07**

(b) Obtain Von Karman momentum integral equation. **07**

OR

(b) Water is flowing through a rough pipe of diameter 600mm at the rate of 550 litres/second. The wall roughness is 3mm. Find the power lost for 1.2 km length of pipe. **07**

Q.3 **(a)** Classify open channel flow and explain each in brief. **07**

(b) A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the slope of the bed is 1 in 1500. The area of the section is 50 sqmt. Find the optimum dimensions of the channel. Also determine the discharge if C = 50. **07**

OR

Q.3 **(a)** What is difference between back water curve and drop down curve. Find the slope of the free water surface in a rectangular channel of width 20m and depth of flow 5m.The discharge through the channel is 60 cumecs. The bed slope of the channel is 1 in 4000. Take C = 60. **07**

(b) Classify different types of hydraulic jump as per USBR. **07**
Water flows at the rate of 2 cumecs along a channel of rectangular section 2m in width. Calculate the critical depth. If a hydraulic jump formed at a point where the u/s depth is 0.25m what would be the rise in water level and power lost in the jump.

Q.4 **(a)** Write procedure for solving problems by Buckingham's π theorem. **07**

(b) Explain different types of hydraulic similarities that must exist between a prototype and its model. **07**

OR

Q.4 **(a)** Explain different types of models and obtain the scale ratio for velocity, area and discharge. **07**

(b) A 1:70 model is constructed of an open channel in concrete which has Manning's N = 0.014. Find the value of N for the model. **07**

Q.5 **(a)** Differentiate between : (a) Impulse and Reaction turbines (b) Radial flow **07**

and Axial flow turbines (c) Kaplan and Propeller turbines

(b) A Pelton turbine is to be designed for the following specification : **07**
Shaft power = 11000 kw,
Head = 365metres,
Speed = 750 r.p.m. ,
Overall efficiency = 86%
Jet diameter = 1/6 of the wheel diameter.
Determine (i) The wheel diameter (ii) The no of jets required and (iii) Diameter of the jet. Take Kv1=0.985 and Ku1=0.45

OR

Q.5 **(a)** Explain cavitation in turbines and centrifugal pumps and write the effects. **07**
(b) Explain characteristics curves of centrifugal pumps with neat sketches **07**

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