

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 ratio 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 sqm. 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 $K_v1=0.985$ and $K_u1=0.45$

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**
