



**VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE**  
[Central Technological Institute, Maharashtra State]  
Matunga, Mumbai-400 019

SEMESTER EXAMINATION *July 2011*  
SEMESTER & PROGRAM *SYBTech Civil Engg.*  
TIME ALLOWED *3 HRS.*  
COURSE (CourseCode) : *Applied Hydraulics-I*

DATE OF EXAM *16*  
*18.07.2011*

MARKS *2.30 parts 5.30 pm*  
*100*

- Instructions
1. All questions carry equal marks.
  2. Figures to the right indicate full marks.
  3. Assume suitable data if necessary

- Q.1** a) A triangular duct resting on a side carries water with a free surface as shown in figure. Obtain the condition for maximum discharge in this channel when a)  $z = 0.5$  and b)  $z = 1$  **5 Marks**
- b) Write a short note on Venturi flume **5 Marks**
- c) Explain Magnus Effect and Circulation **5 Marks**
- d) Water flows at a steady mean velocity of 1.5m/s through a 50 mm diameter pipe sloping upwards at  $45^\circ$  to the horizontal. At a section some distance downwards of the inlet pressure is 700 k Pa and at a section 30 m further along the pipe the pressure is 462 k Pa. Determine the average shear stress at the wall of the pipe and at a radius of 10 mm. **5 Marks**
- Q.2** a) An overflow spillway has its crest at elevation 136.00 m and a horizontal apron at elevation of 102.00 m on the downstream side. Assume Coefficient of discharge  $C_d = 0.735$  for the spillway. The elevation of the energy line just upstream of the spillway crest is 138.00 m. Estimate
- i) the tail water elevation required to form a hydraulic jump.
  - ii) Froude number before jump
  - iii) the postjump depth
  - iv) the prejump depth
  - v) the discharge per unit width
- Neglect energy loss due to flow over the spillway. **10 Marks**
- b) Write a short note on 1. Direct step method 2. Classification of surface profile **10 Marks**
- Q.3** a) A rectangular channel 3.5 m wide is laid on a slope of 0.0005. Calculate the normal depth of the flow for a discharge of  $5.0 \text{ m}^3/\text{s}$ . The Manning's coefficient  $n$  can be taken as 0.02. **5 Marks**
- b) Given the energy loss and Froude number after the jump as 9.00 m and 0.12 respectively, estimate the discharge intensity and initial depth of the hydraulic jump in a rectangular channel. **5 Marks**
- c) Show that for a hydraulically efficient triangular channel section the hydraulic radius  $R = y / 2\sqrt{2}$  where  $y =$  depth of flow **5 Marks**
- d) i) Define 1. Wetted perimeter 2. Hydraulic Radius **2 Marks**  
ii) Sketch with details, the specific energy diagram for constant discharge **3 Marks**
- Q.4** a) Explain Reynolds experiment for classification of fluid flow **5 Marks**
- b) Derive the equation for measurement of head loss in pipe. **5 Marks**
- c) The velocity distribution in the boundary layer is given by :  $u/U = y/\delta$ , where  $u$  is the velocity at a distance  $y$  from the plate and  $u = U$  at  $y = \delta$ ,  $\delta$  being boundary layer thickness. Find : 1. The displacement thickness 2. The momentum thickness 3. The energy thickness 4. The value of  $\delta/\theta$ . **10 Marks**
- Q.5** Write a short note 1. Rayleigh method and Buckingham's Pi method **5 Marks**  
2. Boundary layer -Separation and Control **5 Marks**  
3. Lift characteristics of airfoils **5 Marks**  
4. Energy dissipation **5 Marks**