



Reg. No. :

Name :

Fourth Semester B.Tech. Degree Examination, May 2014
(2008 Scheme)
Branch : CIVIL
08.404 : Fluid Mechanics – II

Time: 3 Hours

Max. Marks: 100

Instruction : Answer all questions in Part A and one question from each Module in Part B.

PART – A

Answer **all** questions :

- I. 1) Express the term best hydraulic channel cross section in four different ways.
- 2) What is Froude number ? Why it is considered as the most predominant number in open channel flow ?
- 3) Distinguish between discharge diagram and specific energy diagram.
- 4) What are the characteristics of the water surface profiles that occur in a step slope channel ?
- 5) If the two systems viz. model and prototype are dynamically similar, is it implied that they are also kinematically and geometrically similar. Why ?
- 6) What do you mean by unit characteristics of turbine ? Why do we prefer them to be plotted for a turbine ?
- 7) Prove that the work saved by fitting the air-vessel to the reciprocating pump is 39.2% in the case of single acting pump.
- 8) How would you compute the specific speed for a multi-stage pump and double section pump ?

(8×5=40 Marks)

P.T.O.



PART – B
Module – I

- II. a) Show that the normal depth ' y_n ' in a hydraulically efficient trapezoidal section

is given by $0.9678 \left[\frac{Q.n}{\sqrt{50}} \right]^{3/8}$. 8

- b) For a hydraulic jump in a trapezoidal channel the velocity and depth after the jump are known to be 0.80 m/s and 1.75 m respectively. Calculate the depth before the jump, energy loss and power dissipated per metre width. 12

OR

- III. a) In a flow through a rectangular channel for a certain discharge the Froude numbers corresponding to the two alternate depths are F_1 and F_2 . Show that

$$\left[\frac{F_2}{F_1} \right]^{2/3} = \frac{2 + F_2^2}{2 + F_1^2}. \quad 8$$

- b) A circular channel of diameter 0.6 m is laid on a slope of 1 in 3000. Calculate the maximum discharge it can convey as an open channel take Manning's n as 0.018. 12

Module – II

- IV. a) What do you understand by repeating variables? How they are selected in dimensional analysis technique? 6

- b) A rectangular channel 2m wide carrying discharge at the rate of $2\text{m}^3/\text{s}$ ends in a free over fall. The bed slope of the flume is 4×10^{-4} . At a certain section of the profile depth is 1.0 m. Assuming $n = 0.014$, find the type of profile and compute its length at least by three steps. 14

OR

- V. a) Show that for model and prototype when gravity and inertia forces are

influencing $\frac{Q_p}{Q_m} = \left[\frac{L_p}{L_m} \right]^{2.5}$. 6

- b) Water is flowing through a pipe of diameter 300 mm with a rate of flow as 250 lps. If the pipe is bent by 135° , find the resultant force on the bend. The pressure of water flowing in the pipe is 400kPa. 14



Module – III

VI. a) Prove that the maximum hydraulic efficiency of a pelton wheel is given by

$$\eta_{H(\max)} = \frac{1}{2} C_v^2 (1 + k \cdot \cos \beta_2); k = \frac{V_{r_2}}{V_{r_1}} \quad 8$$

b) A centrifugal pump delivers salt water against a net head of 12 m at a speed of 100 r.p.m. The vanes are curved backward at 30° with the periphery. Obtain the discharge for an impeller diameter of 30 cm and outlet width of 3 cm at a manometric efficiency 90%. 12

OR

VII. a) Define indicator diagram and prove that the area of it is proportional to the work done by reciprocating pump. 8

b) A turbine is to operate under a head of 25m of 200 rpm, the available discharge is 9m³/s. Assuming an efficiency of 90% determine :

- i) specific speed
- ii) power generated
- iii) performance under a head of 20 m and
- iv) the type of turbine. 12
