C4 . _ 2008 - [illegible] _ Dec . 2021

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Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, December 2021

(2008 Scheme)

08.404 : FLUID MECHANICS – II (C)

Time : 3 Hours Max. Marks : 100

Instructions :

1. All questions under Part A are compulsory.
2. Answer any one full question from each module under Part B.

PART – A

1. (a) Derive Chezy's formula for uniform flow.
   (b) Prove that for a given discharge specific energy in open channel is minimum at critical depth.
   (c) List the different uses of hydraulic jump. How are jumps classified?
   (d) With sketches, explain different types of profiles in steep sloped channels.
   (e) State Reynolds model law and Froude's model law.
   (f) Define (i) Slip (ii) negative slip (iii) Coefficient of discharge
   (g) Explain the purposes of draft tube. What are the types of draft tubes?
   (h) Define specific speed of turbines and derive an expression for the same.

(8 × 5 = 40 Marks)

P.T.O.

PART – B

Module – I

2. (a) Define most efficient channel section. Derive the condition for maximum velocity and maximum discharge through circular section. **10**

(b) The depth of flow of water at a certain section of a rectangular channel of 2m wide is 0.3m. The discharge through the channel is 1 .5m^3/s. Determine whether a hydraulic jump will occur and if so find the height and loss of energy. **10**

OR

3. (a) Derive an expression for energy loss due to hydraulic jump in a horizontal rectangular channel. **10**

(b) A rectangular channel with bottom slope of 0.0064 is to carry 20m^3/sec of water. Determine the width of the channel when the flow is in critical condition. Take n = 0.015. **10**

Module – II

4. (a) Explain momentum equation for steady flow. **8**

(b) A1:50 spillway model has a discharge of 1.25 m^3/s. What is the corresponding prototype discharge? If a flood phenomenon takes 12 hours to occur in the prototype how long should it take in the model? **12**

OR

5. (a) Using Buckingham Π theorem show that velocity through circular orifice of diameter d is given by $v = \sqrt{2gh}\ \phi\left[\left(\frac{d}{h}\right)\left(\frac{\mu}{\rho v h}\right)\right]$ where h - head causing flow, μ-coefficient of viscosity, ρ-mass density, g-acceleration due to gravity. **10**

(b) Water is flowing in a stream 10m wide and a bed slope of 1 in 2000 at a depth of 1m. A dam is placed across the stream raising the depth to 2m. How far upstream will the depth be 1.5m? Identify the surface profile also. Take n = 0.015. **10**

Module – III

5. (a) Determine the power given by the jet of water, to the runner of a Pelton wheel, having a tangential velocity of 20 m/s. The net head on the turbine is 50m and discharge through the jet is $0.03m^3/s$. The vane angle at outlet is 15°. Take coefficient of velocity $C_v = 0.975$. **10**

(b) What is an indicator diagram. Explain with the indicator diagram, work saved by air vessels in a reciprocating pump. **10**

OR

7. (a) Derive the expression for the Torque exerted and work done when a jet of water strikes radially on a series of vanes mounted on a wheel. **10**

(b) A centrifugal pump is running at 1000 rpm. The outlet vane angle of the impeller is 45° and velocity of flow at outlet is 2.5m/s. The discharge through the pump is 200 litres/s when the pump is working against a total head of 20m. If the manometric efficiency of the pump is 80% determine (i) the diameter of impeller at outlet (ii) width of impeller at outlet. **10**

(3 × 20 = 60 Marks)