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K – 4427

Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, September 2020

08.404 : FLUID MECHANICS – II (C)

(2008 Scheme)

Time : 3 Hours

Max. Marks : 80

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) Differentiate uniform and non-uniform flow. What is meant by normal depth in a channel?

   (b) Define most efficient channel section. Derive the expression for most efficient rectangular Section.

   (c) Define specific energy in open channel and discuss specific energy curve.

   (d) List the different assumptions made in deriving dynamic equation for gradually varied flow.

   (e) Explain different types of M profiles in prismatic channels with practical examples.

   (f) Discuss the dimensionless numbers.

   (g) Explain classification of turbines.

   (h) Define specific speed of pumps and derive an expression for the same.

(8 × 5 = 40 Marks)

P.T.O.

PART – B

Module – I

2. (a) A flow of 0.11 m^3/sec flows in a rectangular flume of width 0.60 m. Determine the bottom slope necessary to have uniform flow at a depth of 0.30 m. Also compute the conveyance of flow. Take Chezy's constant as 55. **10**

(b) A rectangular channel 12 m wide carries a discharge of 200 m^3/s. Find the critical depth and critical velocity. What slope will produce this velocity in the channel if Manning's n = 0.02? **10**

OR

3. (a) An irrigation channel of trapezoidal section with side slopes of 3 horizontal to 2 vertical carries discharge of 12 m^3/s. Bed slope of channel is 1 in 6000. The channel is to be lined with a material having roughness coefficient n = 0.015. Design the most economical section of channel. **12**

(b) A 2 m wide channel having side slope 1H : 2 V carries water at a depth of 1 m. Calculate the discharge if the bed slope is 1 in 625 and n = 0.03. Also calculate the average shear stress at the channel boundary. **8**

Module – II

4. (a) Derive an expression for pressure difference Δp in a pipe of diameter d and length 1 due to viscous flow depends on the velocity V, viscosity μ and density ρ using Buckingham's π theorem. **10**

(b) An air duct of cross-sectional area 1 m^2 at inlet is reduced to 0.5 m^2 at a 45° bend. Find the magnitude and direction of the resultant force exerted by air on the bend if the velocity of flow at inlet is 12 m/s and the pressure is 25 kPa. Assume specific weight of air as 11.6 N/m^3. **10**

OR

5. (a) Define (i) Dimensional homogeneity (ii) Undistorted models (iii) Reynold's model law and (iv) Scale effect in models. **8**

(b) A river 50 m wide and a bed slope of 1 in 10,000 have uniform flow at 4 m depth. Compute the length of backwater curve produced by an afflux of 3 m on downstream side. Identify the surface profile also. Take n = 0.03. **12**

Module – III

6. (a) For a Pelton wheel, a jet of cross section area 0.15 m^2 is discharging through the nozzle at the rate of 0.18 m^3/s under a head of 32 m. The shaft power is 44 kW and mechanical efficiency is 94%. Calculate the power lost (i) in the nozzle and (ii) in the runner. **10**

(b) A horizontal jet of water 2 cm dia. and velocity 10 m/s strikes normally at the centre of a 20 cm size square plate having weight of 98 N, suspended vertically by a hinge on top edge. Find the horizontal force applied at the lower edge to keep the plate vertical. If the plate is allowed to deflect freely, find the inclination of the plate with the vertical due to the impact of jet. **10**

OR

7. (a) Explain the effect of friction and acceleration in suction and delivery pipes of a reciprocating pump. **10**

(b) Calculate the diameter and speed of the runner of a Kaplan turbine developing 6000 kW under an effective head of 5 m. Overall efficiency of the turbine is 90%. The dia. of boss is 0.4 times the external dia. of runner. The speed ratio is 2.0 and flow ratio is 0.6. What is the specific speed of the turbine? **10**