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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech II Year II Semester Supplementary Examinations February-2022

HYDRAULICS & HYDRAULIC MACHINERY

(Civil Engineering)

Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

- 1 A concrete lined circular channel of diameter 3m has a bed slope of 1 in 500. Find out velocity and flow rate for conditions of i) Max. Velocity ii) Max. Discharge. Assume Chezy's constant $C=50$ **12M**

OR

- 2 A Derive an expression for maximum velocity of flow through a circular section. **6M**
 b Determine the expression for the most economical trapezoidal section in terms of side slope. **6M**

UNIT-II

- 3 a Derive an expression for hydraulic jump in rectangular channel. **6M**
 b What are the applications of hydraulic jump? **6M**

OR

- 4 a A hydraulic jump forms at the downstream end of spillway carrying $17.93 \text{ m}^3/\text{s}$ discharge. If depth before jump is 0.80 m, determine the depth after the jump and energy loss. **6M**
 b Write about the classification of bottom channel slope. **6M**

UNIT-III

- 5 A jet of water having a velocity of 30m/s strikes a series of radial curved vanes mounted on a wheel which is rotating at 200r.p.m. The jet makes an angle of 20 degrees with the tangent to the wheel at inlet and leaves the wheel with a velocity of 5m/s at an angle of 130 degrees to the tangent to the wheel at outlet. Water is flowing from outward in a radial direction. The outer and inner radii of the wheel are 0.5m and 0.25m respectively. Find vane angles at inlet and outlet. Work done per unit weight of water and efficiency of the wheel. **12M**

OR

- 6 A jet of water having a velocity of 35 m/s impinges on a series of vanes moving with a velocity of 20 m/s. The jet makes an angle of 30 degrees to the direction of motion of vanes when entering and leaves at an angle of 120 degrees. Draw the triangles of velocities at inlet and outlet and find the angles of vane tips so that water enters and leaves without shock, the work done per unit weight of water entering the vanes and the efficiency. **12M**

UNIT-IV

- 7 The following data is given for a Francis turbine 12M
 Net head=60 m; Speed= 700r.p.m; shaft power =294.3KW; Overall efficiency=84%;
 Hydraulic efficiency=93%; flow ratio=0.20; breadth ratio=0.1; Outer diameter of the
 runner=2 inner diameter of runner. The thickness of vanes occupy 5% of
 circumferential area of the runner, velocity of flow is constant at inlet and discharge is
 radial at outlet. Determine: (i) Guide blade angle (ii) Runner vane angles at inlet and
 outlet (iii) Diameters of runner at inlet and outlet and (iv) Width of wheel at inlet.

OR

- 8 A Kaplan turbine runner is to be designed to develop 9100KW. The net available head is 12M
 5.6m, If the speed ratio=2.09, Flow ratio=0.68, overall efficiency=86% & diameter of
 the boss is $\frac{1}{3}$ the diameter of the runner. Find the diameter of the runner and its speed
 and the specific speed of the turbine.

UNIT-V

- 9 a A 1.0 m long model of a ship is towed in a towing tank at a speed of 81 cm/s. To 6M
 what speed of the ship of 64 m long does this correspond.
 b For laminar flow in a pipe the drop in pressure ΔP is a function of the pipe length L, 6M
 its diameter D, mean velocity of flow V and the dynamic viscosity. Using
 Rayleigh's method, develop an expression for ΔP .

OR

- 10 a What is the difference between single-stage and multistage pumps? Describe 6M
 multistage What is the difference between single-stage and multistage pumps?
 Describe multistage
 b The diameter of an impeller of a centrifugal pump at inlet and outlet are 20cm and 6M
 40cm respectively. Determine the minimum speed for starting the pump if it works
 against a head of 25m.

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