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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech II Year II Semester Supplementary Examinations March-2021**HYDRAULICS & HYDRAULIC MACHINERY**

(Civil Engineering)

Time: 3 hours

Max. Marks: 60

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

UNIT-I

- 1 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

OR

- 2 In a rectangular channel 3.5m wide laid at a slope of 0.0036, uniform flow occurs at a depth of 2m. Find how high can the hump be raised without causing afflux? If the upstream depth of flow is to be raised to 2.5m. What should be the height of hump? Take $n = 0.015$ in Manning's formula 12M

UNIT-II

- 3 a Derive an expression for depth of hydraulic jump in terms of upstream Froude number F_1 4M
 b Find the rate of change of depth of water in a rectangular channel of 10m wide and 1.5m deep, when the water is flowing with a velocity of 1 m/s. The flow of water through the channel of bed slope 1 in 4000, is regulated in such a way that energy line is having a slope of 0.00004. 8M

OR

- 4 a A hydraulic jump forms at the downstream end of spillway carrying 17.93 m³/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 Derive the equation for force exerted by a jet on stationary inclined flat plate. 6M
 b Find the force exerted by a jet of water of diameter 75mm on a stationary flat plate, when the jet strikes the plate normally with velocity of 20m/s. 6M

OR

- 6 A jet of water of diameter 50 mm strikes a curved plate having a velocity of 20 m/s. The curved plate is moving with a velocity of 10 m/s in the direction of the jet. The jet is deflected through an angle of 60°. Assuming the plate smooth, find: (i) Force exerted by the jet on the vane in the direction of the motion. (ii) work done per second by the jet. 12M

UNIT-IV

- 7 a Draw the velocity triangles, work done and maximum hydraulic efficiency of a pelton wheel turbine. 6M
 b An inward flow reaction turbine has external and internal diameters as 1m & 0.6 m. The hydraulic efficiency of the turbine is 90% when the head on the turbine is 36m. The velocity of flow at outlet is 2.5m/s and discharge at outlet is radial. If the vane angle at outlet is 15 degrees & width of the wheel is 100mm at inlet and outlet, Determine (i) The guide blade angle (ii) speed of the turbine (iii) vane angle of the runner at inlet (iv) volume flow rate of turbine (v) power developed. 6M

OR

- 8 A Kaplan turbine runner is to be designed to develop 9100 kW. The net available head is 5.6 m, 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. 12M

UNIT-V

- 9 a What is meant by priming? 6M
b The diameters of an impeller of a centrifugal pump at inlet and outlet are 30 cm and 60 cm respectively. Determine the minimum starting speed of the pump if it works against a head of 30 m. 6M

OR

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

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