Q.P. Code: 16CE113 **R16**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech II Year II Semester Supplementary Examinations October-2020

HYDRAULICS & HYDRAULIC MACHINERY

(CIVIL ENGINEERING)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1 Determine the expression for the most economical depth of water in terms of the diameter of a channel of circular cross-section for maximum discharge. **12M**

OR

2 **a** Derive the condition for a rectangular channel to be most efficient **6M**

b Explain the terms specific energy of a flowing liquid, minimum specific energy, critical depth, critical velocity and alternate depth applied to non-uniform flow. **6M**

UNIT-II

3 **a** What is back water curve and afflux .Derive the expression for length of back water curve? **6M**

b What are the classifications of channel bottom slopes and briefly explain characteristics of surface profiles. **6M**

OR

4 **a** Derive an expression for hydraulic jump in rectangular channel. **6M**

b What are the applications of hydraulic jump? **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 7.5 cm diameter jet having a velocity of 30 m/s strikes a flat plate, the normal of which is inclined at 45 degrees to the axis of the jet. Calculate the normal pressure on the plate. (i) When the plate is stationary and (ii) When the plate is moving with a velocity of 15 m/s and away from the jet. Also determine the power and efficiency of the jet when the plate is moving. **12M**

UNIT-IV

7 **a** A Pelton wheel is to be designed for a head of 60m when running at 200r.p.m. The pelton wheel develops 95.6475kW shaft power. The velocity of the buckets =0.45 times the velocity of the jet, overall efficiency=0.85and co-efficient of the Velocity=0.98. **6M**

b A jet strikes the buckets of Pelton wheel, which is having shaft power as 15450kW. The diameter of each jet is given as 200mm.If the net head on the turbine is 400m. Find the overall efficiency of the turbine, take Cv=1.0. **6M**

OR

8 A Francis turbine working under a head of 30 m has a wheel diameter of 1.2 m at the entrance and 0.6 m at the exit. The vane angle at the entrance is 90 degrees and guide blade angle is 150 degrees. The water at the exit leaves the vane without any tangential velocity and the velocity of flow in the runner is constant. Neglecting the effect of draft tube and losses in the guide and runner passages, determine the speed of wheel in r.p.m. and vane angle at exit. State whether the speed calculated is synchronous or not. If not, what speed would you recommend to couple the turbine with an alternator of 50 cycles? **12M**

UNIT-V

9 The internal and external diameter of an impeller of a centrifugal pump which is running at 1000 r.p.m. is 200 mm and 400 mm respectively. The discharge through pump is 0.04m3 /sec and velocity of flow is constant and equal to 2 m/sec. The diameters of suction and delivery pipes are 150 mm and 100 mm respectively and suction and delivery heads are 36 m and 30 m of water respectively. If the outlet vane angle is 450 and power required to drive the pump is 16.186 KW, determine: (i) Vane angle of impeller at inlet (ii) Overall efficiency of the pump and (iii) Mono-metric efficiency of pump. **12M**

OR

10 **a** What are similarity laws? **6M**

b What is meant by dimensional analysis? What are the uses? **6M**

*** END ***