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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**B.Tech II Year II Semester Supplementary Examinations July-2021**

**HYDRAULICS & HYDRAULIC MACHINERY**

(Civil Engineering)

Time: 3 hours

Max. Marks: 60

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

**UNIT-I**

- 1 What is meant by most economical section? Also derive the condition for a trapezoidal channel to be most economical. 12M

OR

- 2 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

**UNIT-II**

- 3 a What is hydraulic jump and what are the assumptions of hydraulic jump. 6M  
b What are the different types of hydraulic jump and explain with neat sketches? 6M

OR

- 4 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

**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 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 12M  
(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

**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=0.85 and 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  $C_v=1.0$  6M

OR

- 8 a Draw the velocity triangles, work done and maximum hydraulic efficiency of a pelton wheel turbine **5M**
- b An inward flow reaction turbine has external and internal diameters as 1m & 0.6 m. **7M**  
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 @ 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

**UNIT-V**

- 9 a What it is meant by priming? **5M**
- 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 30m. **7M**

OR

- 10 a What are similarity laws? **6M**
- b What is meant by dimensional analysis? What are the uses? **6M**

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