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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)**B.Tech III Year I Semester Supplementary Examinations July-2022****HYDRAULIC ENGINEERING**

(Civil Engineering)

Time: 3 hours

Max. Marks: 60

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

UNIT-I

- 1 Prove that for a channel of circular section, the depth of flow $d=0.81D$ for maximum velocity. **L1 12M**

OR

- 2 a Derive the condition for a rectangular channel to be most economical. **L1 6M**
 b In a rectangular channel 5.5m wide laid at a slope of 0.0036, uniform flow occurs at a depth of 3.5m. Find how high can the hump be raised without causing afflux? If the upstream depth of flow is to be raised to 3m. What should be the height of hump? Take $n=0.015$ in manning's formula. **L3 6M**

UNIT-II

- 3 What are assumptions of gradually varied flow? Derive the Dynamic equation of gradually varied flow. **L1 12M**

OR

- 4 a What is hydraulic jump and what are the assumptions of hydraulic jump. **L1 6M**
 b What are the different types of hydraulic jump and explain with neat sketches? **L1 6M**

UNIT-III

- 5 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. **L3 12M**

OR

- 6 A jet of water of diameter 7.5 cm strikes a curved plate at its centre with a velocity of 20m/sec. the curved plate is moving with a velocity of 8 m/sec in the direction of jet. The jet is deflected through an angle of 165° . Assuming the plate smooth. Find
 i) Force exerted on the plate in the direction of jet
 ii) Power of jet
 iii) Efficiency of jet **L3 12M**

UNIT-IV

- 7 A three stage centrifugal pump has impeller 42 cm in diameter and 2.5 cm wide at outlet. The vanes are curved back at the outlet at 45 and reduce the circumferential area by 10%.The manometric efficiency is 90% and overall efficiency is 80%. Determine the head generated by the pump when running at 1050r.p.m. delivering 65 litres per second. What should be the shaft horse power? **L3 12M**

OR

- 8 a** The pressure difference Δ in a pipe of diameter D and length L due to turbulent flow depends on the velocity V , Viscosity μ , density ρ and roughness K . Using Buckingham's theorem. Obtain an expression for Δ **L3 6M**
- b** Define the terms: model, prototype, hydraulic similitude. **L1 6M**

UNIT-V

- 9** An inward flow reaction turbine has external and internal diameters as 1m & 0.6m. 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 at inlet (iv) volume flow rate of turbine (v) power developed. **L3 12M**

OR

- 10 a** Define (i) speed ratio (ii) Flow ratio (iii) Diameter of turbine (iv) Radial discharge. **L2 6M**
- b** List out various types of efficiencies of a turbine in detail. **L1 6M**

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