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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)**B.Tech II Year I Semester Supplementary Examinations July-2022****FLUID MECHANICS & HYDRAULICS MACHINERY**

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

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

**UNIT-I**

- 1 a Obtain an expression for capillary rise of a liquid. **L1 6M**  
 b Calculate the density, specific weight and weight of one litre of a petrol of specific gravity is 0.7. **L2 6M**

**OR**

- 2 a Define surface tension. Derive the expression for surface tension on liquid droplet. **L1 6M**  
 b Calculate the capillary raise in a glass tube of 2.5mm diameter when immersed vertically water & mercury. Take surface tension is 0.0725 N/m for water and 0.52 N/m for mercury. The specific gravity of mercury is given 13.6 and angle of contact is 1300. **L2 6M**

**UNIT-II**

- 3 a Explain different types of flow in detail. **L1 6M**  
 b The water is flowing through a pipe having diameter 20cm and 10cm at section 1 and 2 respectively. The rate of flow through pipe is 35 liters/s. The section 1 is 6 m above the datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm<sup>2</sup>, Find the intensity of pressure at section 2. **L2 6M**

**OR**

- 4 a Derive Euler's equation of motion. **L1 6M**  
 b A 300 mm diameter pipe carries water under a head of 20 m with a velocity of 3.5 m/s. if the axis of the pipe turns through 45°, find the magnitude and direction of the resultant force at the bend. **L2 6M**

**UNIT-III**

- 5 a Explain pitot tube and pitot static tube. **L1 6M**  
 b An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30cm diameter. The pressure difference measured by mercury oil in differential manometer on the two sides of the orifice meter gives a reading of 50 cm of mercury. Find the rate of flow of file of specific gravity 0.9 when the coefficient of discharge of the orifice meter is 0.64. **L2 6M**

**OR**

- 6 a List out minor losses in pipe flow and write the equations for all minor losses. **L1 6M**  
 b Recall the concept of pipes in series and parallel. **L1 6M**

**UNIT-IV**

- 7 a Explain the factor to be considered for selection of site for hydroelectric power plant. **L1 6M**
- b A jet of 50 mm diameter delivers a stream of water at 20 m/s perpendicular to a plate that moves away from the jet 5 m/s. Find the force on the plate, work done and efficiency of jet. **L2 6M**

**OR**

- 8 a Derive the expression for force and the efficiency by the jet when it strikes at the centre of moving curved plate. **L1 6M**
- b A 7.5 cm diameter jet having a velocity of 30 m/s strikes a flat plate, the normal of which is inclined at  $45^\circ$  to the axis of the jet. Find the normal pressure on the plate when (i) the plate is stationary, and (ii) when the plate is moving with a velocity of 15 m/s and away from the jet. **L2 6M**

**UNIT-V**

- 9 a What are the working principle and design specifications of a Kaplan turbine? Explain. **L1 6M**
- b The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 rpm. The vane angles of the impeller at inlet and outlet are  $20^\circ$  and  $30^\circ$  respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water. **L2 6M**

**OR**

- 10 a Write a note on net positive suction head (NPSH). **L1 6M**
- b The following data is given for the Francis turbine. Net head  $H = 60$  m, Speed  $N = 700$  r.p.m., Shaft Power = 294.3 kW,  $\eta_o = 84\%$ ,  $\eta_h = 93\%$ , flow ratio = 0.2, breadth ratio  $n = 0.1$ , outer diameter of the runner = 2 X inner diameter of the runner. The thickness of vane occupies 5% of circumferential area of the runner, velocity of flow is constant at inlet and outlet and discharge is radially 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. **L2 6M**

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