Code No: R7210202 **R7**

II B.Tech I Semester(R07) Supplementary Examinations, May/June 2010
FLUID MECHANICS AND HYDRAULIC MACHINERY
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define dynamic viscosity and kinematic viscosity. What are their units? Explain the significance of viscosity on fluid motion.
   (b) Find the pressure in N/m^2 represented by a column of
      i. 10cm of water
      ii. 5 cm of oil of relative density 0.75
      iii. 2cm of mercury. [8+8]

2. (a) Define and explain stream line, path line and streak line in fluid mechanics.
   (b) For the following flow, find the equation of the streamline passing through (1,1)
   $v = 3xi - 3yj$ [8+8]

3. (a) Define coefficient of discharge. Discuss how it varies for venturi meter, orifice meter and nozzle meter. What factors influence the same?
   (b) A pitot tube is inserted in the middle of a pipe of 30 cm diameter. The static pressure of the tube is 10cm of mercury vacuum. The stagnation pressure at the center of the pipe is 1 N/cm^2. Calculate the rate of flow of water through the pipe. The mean velocity is 0.85 times the maximum velocity in the pipe. Assume coefficient of the pitot tube as 0.98. [8+8]

4. (a) A jet of water of 86 mm diameter strikes a curved vane at the centre with a velocity of 30 m/sec. The curved vane is moving with a velocity of 8m/sec in the direction of the jet. Find the force exerted on the plate in the direction of the jet, power and efficiency of the jet. Assume that the plate is smooth.
   (b) Explain, how you find the impact of jet striking an unsymmetrical fixed curved plate at one of the tips. [8+8]

5. (a) Describe storage and pondage in detail
   (b) Draw a line diagram of general arrangement of a pumped storage power plant and explain. [8+8]

6. (a) What do you mean by gross head, net head and efficiency of a turbine? Explain the different types of the efficiencies of a turbine.
   (b) A Pelton wheel has a mean bucket speed of 35 m/s with a jet of water flowing at the rate of 1 m^3/s under a head of 270 m. The buckets deflect the jet through an angle of 170^0. Calculate the power delivered to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.98. [16]

7. (a) Define the terms 'unit power', 'unit speed' and 'unit discharge' with reference to a hydraulic turbine. Also derive expressions for these terms.
   (b) Sketch and describe a modern method of regulation to maintain a constant speed for either
      i. Pelton wheel or
      ii. Francis turbine. [8+8]

8. (a) What do you mean by manometric efficiency, mechanical efficiency and overall efficiency of a centrifugal pump?
   (b) Find the power required to drive a centrifugal pump which delivers 0.02 m^3/s of water to a height of 30 m through a 10 cm diameter pipe and 90 m long. The overall efficiency of the pump is 70% and f = .009. [8+8]

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