PVP 14

Code: ME3T3, AE3T3

II B.Tech - I Semester – Regular Examinations – December 2015

FLUID MECHANICS AND HYDRAULIC MACHINES

(Common for ME, AE)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1. a) What do you understand by Hydrostatic law?
   b) Distinguish between rotational flow and irrotational flow. Give one example of each.
   c) Write three dimensional continuity equation for unsteady compressible fluid flow.
   d) What do you understand by the terms major energy loss and minor energy loss in pipes.
   e) State angular momentum principle.
   f) Write an expression for force exerted by Jet on moving inclined plate.
   g) Define the specific speed of a centrifugal pump.
   h) Define specific speed of Turbine.
   i) Define slip and coefficient of discharge of reciprocating pumps.
   j) What is meant by cavitation?
   k) Draw neat sketch of centrifugal pump and Label it.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks. 3 x 16 = 48 M

2. a) Explain how vacuum pressure is measured with the help of a U-tube manometer. 7 M

b) The velocity at a point is given by $V = (4t + 3x^2 + 2y)i + (t^2 + 2xy + 3y^2)j$. Determine the local acceleration and total acceleration at a point (2,3) for t = 1.5 seconds. 9 M

3. a) Derive Euler's equation of motion along a stream line and hence drive the Bernoulli's equation? State the significance of each term in Bernoulli's equation and their assumptions. 8 M

b) Two pipes each 300 m long are available for connecting to a reservoir from which a flow of 0.085 m^3/s is required. If the diameters of the two pipes are 0.3 m and 0.15m respectively. Find the ratio of the head lost when the pipes are connected is series to the head lost when they are connected in parallel. Neglect minor losses. 8 M

4. a) Derive the equation for discharge of a liquid through a Venturimeter. 7 M

b) A jet of water of diameter 7.5 cm moving with a velocity of 25 m/s strikes a fixed plate in such a way that the angle between the jet and plate is 60^0. Find the force exerted by the jet on the plate in the direction normal to the plate and in the direction of the jet. 9 M

5. a) Explain what do you understand by unit speed, unit power and unit discharge of turbine. 6 M

b) A Francis turbine running at 400 rpm when head available is 60 m. The inner and outer diameters are 50 cm and 100 cm respectively. The constant velocity of the flow through the runner is 10 m/s and hydraulic efficiency is 80%. Determine the inlet and outlet blade angles of the rotating blades. 10 M

6. a) Show from first principle, the work saved against friction in the delivery pipe of a double-acting reciprocating pump by fitting air vessel is 39.2% . 7 M

b) A centrifugal pump is running at 1000 r.p.m. The outlet vane angle of the impeller is 30^0 and velocity of flow at outlet is 3 m/s. The pump is working against a total head of 30 m and the discharge through the pump is 0.3 m^3/s. If the manometric efficiency of the pump is 75%, determine:

i) the diameter of the impeller, and

ii) the width of the impeller at the outlet.

9 M