

1078

**B.E. (Mechanical Engineering) Fifth Semester  
MEC-506: Fluid Machinery**

Time allowed: 3 Hours

Max. Marks: 50

**NOTE:** Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.

x-x-x

1. (a) The Force exerted by a jet on an inclined moving plate, in the direction of motion of the plate. is given as.....
- (b) Classify turbines on the basis of direction of flow through runner.
- (c) What is use of Breaking jet in Pelton.wheel turbine.
- (d) What are different types of Draft tubes.
- (e) What is significance of unit quantities.
- (f) Why Vortex casing is better than Volute casing of Centrifugal pump.
- (g) What is Weber's number.
- (h) What is significance of Ideal Indicator diagram for a Reciprocating pump.
- (i) What is principle of Air lift pump.
- (j) What is Slip in case of Fluid coupling. (1\*10= 10)

**PART-A (Attempt any two questions)**

2. A jet of water. having a velocity of 15 m/s. strikes a curved vane which is moving with a velocity of 6 m/s in the same direction as that of jet at inlet. The vane is so shaped that jet is deflected through  $135^\circ$ . The diameter of the jet is 150 mm. Assuming the vane to be smooth, Find: (i) the force exerted by the jet on the vane in the direction of motion, (ii) power of the vane, (iii) efficiency of the vane. (10)
3. (a) The three-jet Pelton turbine is required to generate 10,000 KW under a net head of 400 m. The blade angle at outlet is  $15^\circ$  and the reduction in the relative velocity while passing over the blade is 5 %. If the overall efficiency of the wheel is 80%.  $C_v = 0.98$  and speed ratio = 0.46, then find : (i) diameter of the jet, (ii) total flow in  $m^3/s$  and (iii) the force exerted by a jet on the buckets. If the jet ratio is not to be less than 10, find the speed of the wheel for a frequency of 50 hertz/sec and the corresponding wheel diameter. (10)



4. (a) Prove that degree of Reaction for Pelton turbine is zero. (8)  
(b) Describe Thomos cavitation factor for Reaction turbine. (2)

**PART-B (Attempt any two questions)**

5. (a) What is significance of using Multi-stage Centrifugal pump. (2)

(b) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1200 r.p.m. works against a total head of 75 m. The velocity of flow through the impeller is constant and equal to 3 m/s. The vanes are set back at an angle of  $30^\circ$  at outlet. If the outer diameter of the impeller is 600 mm and width at outlet is 50 mm, determine: (i) vane angle at inlet. (ii) work done per second by impeller, (iii) manometric efficiency. (8)

6. (a) What is an air vessel. Calculate the amount of work saved, against friction in the delivery pipe of single acting reciprocating pump, by fitting an air vessel. (6)

(a) Explain working of Torque convertor. (4)

7. The pressure difference  $\Delta p$  in a pipe of diameter  $D$  and length  $L$  due to turbulent flow depends upon the velocity  $V$ , viscosity  $\mu$ , density  $\rho$  and roughness  $k$ . Using Buckingham's  $\Pi$ -theorem obtain an expression for  $\Delta p$ . (10)

X-X-X