Fluid Machinery
(ME-306, DEC 2006)

Time: 3 Hrs
Max Marks: 60

Note: Section A is compulsory. Attempt any four questions from Section B and any two from Section C.

Section-A

1. a) Explain the role of air vessel in reciprocating pump.
   b) How is the minimum starting speed of a centrifugal pump computed?
   c) Define specific speed of a turbine.
   d) Distinguish between Impulse turbines and reaction turbines.
   e) Explain the applications of surge tanks for hydraulic turbines.
   f) Distinguish between volute casing and vortex casing in centrifugal pumps.
   g) How do you classify the reciprocating pumps?
   h) Define terms speed ratio, flow ratio and jet ratio.
   i) What is priming of centrifugal pump and why it is necessary?
   j) Obtain an expression for force exerted by jet of water on a vertical plate in direction of Jet.

Section-B

2. Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceed 50%.
3. What is the importance of a draft tube in a Francis turbine? Discuss different types of draft tubes.
4. Determine the amount of work saved by providing an air vessel in a double acting reciprocating pump.
5. Explain with help of neat sketches, Hydraulic coupling and Hydraulic converter.
6. Define specific speed of centrifugal pump. Derive expression for the same.

Section-C

7. A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1200 rpm, works against a total head of 75 cm. The velocity of flow through the impeller is constant and equal to 3m/s. The vane angles are set back at an angle of 30º at outlet. If the outer diameter of the impeller is 60 cm and width of outlet 5 cm. Determine (a) Vane angle at inlet (b) Work done per second by impeller (c) Manometric efficiency.
8. The following data related to Pelton wheel. Head at the base of the nozzle = 125 mm, Diameter of Jet = 7.5 cm, Discharge of the nozzle = 200 litres/second, Shaft power = 192 k W, Power absorbed in Mechanical Resistance = 3.675 k W
   Determine (i) Power lost in nozzle (ii) Power lost due to hydraulic resistance in the runner.
9. A Kaplan turbine runner is to be designed to develop 7500kW. The net available head is 10 m. Assume that the speed ratio is 1.8 and flow ratio 0.6. If the overall efficiency is 70% and diameter of the basis is 0.4 times the diameter of the runner. Find the diameter of runner, its speed and specific speed.