Question Bank

Fluid Machinery (BTME-603)

Section-A

- 1. State impulse momentum principle and write its equation.
- 2. Derive the equation of work done for the jet impingement upon a moving flat inclined plate.
- 3. Classify the turbines on the basis of head available.
- 4. What is specific speed of turbine?
- 5. What are the different forms of draft tubes?
- 6. What is slip of the impeller?
- 7. What is priming?
- 8. Define overall efficiency of turbine.
- 9. Name the various problems commonly experienced during operation of centrifugal pumps.
- 10. What is Thomas Cavitation number?
- 11. What is the function of braking jet in Pelton turbine?
- 12. State advantages of Kaplan turbine over Propeller Turbine.
- 13. What is Cavitation, List down cavitation susceptible areas in turbines and pumps?
- 14. Why Jet pumps have been phased out?
- 15. What is the function of draft tube?
- 16. Differentiate between fluid coupling and Torque converter.
- 17. Define the term "Manometric Head"?
- 18. What is the function of surge tank?
- 19. What is the function of Air vessel?
- 20. What are 'Unit Quantities'?

Section - B

- 1. Derive an expression for specific speed of pump.
- 2. Derive an expression for the minimum speed for starting a centrifugal pump.
- 3. State "Impulse momentum equation", also give its applications. Why the case of jet striking single moving vane is not feasible?
- 4. A Pelton wheel is to be designed for the following specifications: Power (BP) 9560 kW, Head = 350 m, speed = 750 r.p.m., overall efficiency = 85%, jet diameter not to exceed 1/6th of wheel diameter. Determine i) wheel diameter, ii) diameter of jet, iii) number of jets required.
- 5. Derive an equation for work done by the jet impingement upon a series of moving curved vanes mounted radially on a wheel.
- 6. Derive Eular's equation for energy conversion through hydrodynamic rotor.
- 7. Show from the first principles that work saved in a single-acting reciprocation pump, by fitting an air vessel is 84.8%.
- 8. How submersible pump is different from a Monoblock pump?
- 9. List down cavitation susceptible areas in turbines and pumps?
- 10. What is the function of undercut on Pelton turbine blades?

Section - C

 In an Inward flow reaction turbine (vertical shaft) the sum of the pressure and kinetic heads at entrance to the spiral casing is 132 m and vertical distance between this section and tail race level is 3.3 m. The peripheral velocity of the runner at entry is 33 m/s, the radial component of velocity of water (velocity of flow) is constant at 11.0 m/s and the discharge from the runner is without whirl and radial. The hydraulic losses are:

(a) Losses between turbine entrance and discharge from guide vanes = 4.95m,

(b) Losses in the runner = 8.8m,

(c) Losses in the draft tube = 0.88m,

(d) Kinetic energy rejected to tail race = 0.55m.

Determine:

- (i) the guide blade angle and runner blade angle at inlet;
- (ii) the pressure head at entry to and discharge from runner.
- 2. A Kaplan turbine operating under a head of 7.5m develops 1835 kW with an overall efficiency of 87%. The turbine is set 2.5 m above the tail level and vacuum gauge is inserted at turbine outlet records a suction head of 3.15 m. Calculate the efficiency of the draft tube if it has an inlet diameter of 3 m and the loss of head due to friction in the draft tube equals 25% of kinetic head at outlet.
- 3. (a) What is the function of Draft tube? Derive an expression for efficiency of draft tube.(b) Discuss in detail with diagram the governing mechanism of francis turbine.
- 4. A centrifugal pump impeller has diameter of 60 cm and width 6 cm at outlet. The pump runs at 1450 rpm and delivers 0.8 m₃/s against a head of 80m. The leakage loss after the impeller is 4% of discharge, the mechanical loss is 10 kW and the hydraulic efficiency is 80%. Determine the blade angle at outlet, the power required and overall efficiency of pump.
- 5. Derive expressions for model relationships in case of a hydraulic turbine.
- 6. Define specific speed of a turbine and its importance. Derive an expression for the same.
- What is negative slip in Reciprocating pump? Explain with sketches the function of an air vessel in a reciprocating pump.
- 8. A single acting reciprocating pump has a plunger diameter of 75 mm and stroke length 150 mm. It takes supply of water from a Pump 3 m below the pump through a pipe 5m long and 40 mm diameter. It delivers water to a tank 12 m above the pump through a pipe 30 mm diameter and 15 m long. If the separation takes place at 75KN/m² below atmospheric pressure, find the maximum speed at which the pump may be operated without separation, plunger operates with S.H.M.
- 9. What are performance curves? Discuss importance and plotting of these curves in detail for impulse and reaction turbines.
- 10. (a) Explain with neat sketch the construction and working of a Differential Accumulator.
 - (b) With the help of neat diagram, explain the working principle of fluid coupling. Also, describe the slip and the efficiency of the fluid coupling
 - (c) Discuss in detail the working of hydraulic ram with diagram