Roll No. | | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 09

B.Tech.(ME) (2011 Onwards) (Sem.–6)

FLUID MACHINERY

Subject Code :BTME-603

Paper ID : [A2363]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

(a) Define Impulse momentum equation.

(b) Why no draft tube is required with Pelton turbine?

(c) Differentiate between Kaplan and Propeller turbine.

(d) How Cavitation can be prevented in turbines and pumps?

(e) Define the term "Manometric Head".

(f) What is the function of surge shaft?

(g) What is the function of Air vessel?

(h) What are 'Unit Quantities'?

(i) Define Pascal's law.

(j) How submersible pump is different from a Monoblock pump?

SECTION-B

2 Derive Eular's equation for energy conversion through hydrodynamic rotor.

3 What is the function of Draft tube? Derive an expression for efficiency of draft tube.

4 Find the height from the water surface at which a centrifugal pump may be installed in the following case to avoid cavitation :

Atmospheric pressure = 1.0 bar;

Vapor pressure = 0.022 bar;

Inlet and other losses in suction pipe = 1.42 m;

Effective head of pump = 49 m;

Cavitation parameter = 0.115.

5. Define specific speed of a turbine and its importance. Derive an expression for the same.

6 Explain with neat sketch the construction and working of a Differential Accumulator.

SECTION- C

7 In a Pelton Wheel, the bucket deflects the jet by 170° and the relative velocity is reduced by 12% due to bucket friction. For a speed ratio of 0.47, calculate from first principle the hydraulic efficiency of the wheel. The bucket diameter of the wheel is 90 cm and there is one jet for which $C_v = 0.98$. The actual efficiency of the wheel is 0.9 times its theoretical efficiency. The wheel develops 1700kW under a head of 550m.

Calculate :

(a) the speed of the wheel in r.p.m. and

(b) the diameter of the nozzle.

8. (a) Show from the first principles that work saved in a single-acting reciprocation pump, by fitting an air vessel is 84.8 percent.

(b) A single acting reciprocating pump has a plunger diameter of 75 mm and stroke length 150 mm. It takes supply of water from a sump 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 15m long. If the separation takes place at $75KN/m^2$ below atmospheric pressure, find the maximum speed at which the pump may be operated without separation, plunger operates with S.H.M.

9 In an Inward flow reaction turbine (vertical shaft) the sum of the pressure and kinetic heads at entrance to the spiral casing is 132m and vertical distance between this section and tail race level is 3.3m. The peripheral velocity of the runner at entry is 33m/s, the radial component of velocity of water (velocity of flow) is constant at 11.0m/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.